35¢

THE WELDING ENGINEER

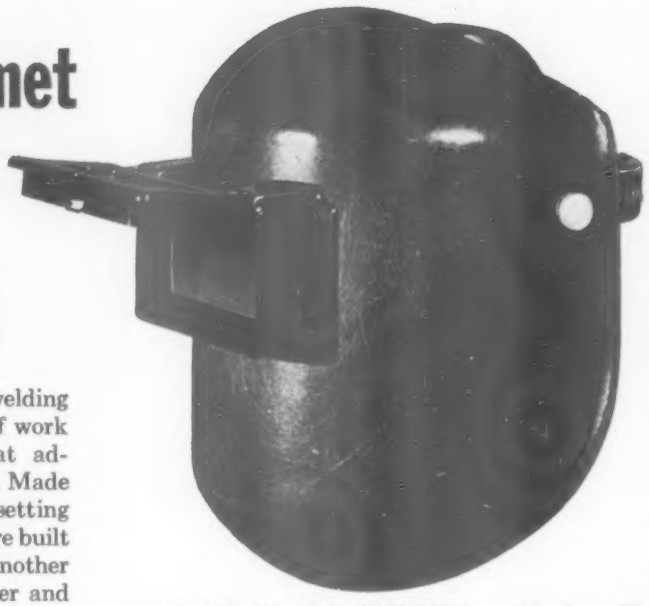
AUGUST, 1953

A McGRAW-HILL PUBLICATION

THE JACKSON

New Lift-Front Helmet

See it...Try it



✶ Plastic Lens Holder

✶ Improved Helmet Shell

✶ Improved Headgear

✶ **Lens Holder** has hinged front, holding welding lens and cover glass. It permits inspection of work without raising the entire helmet—a great advantage, especially for work in close quarters. Made of high-impact, compression molded, thermosetting plastic, it is strong and durable. Coil springs are built inside the hinges to hold front up or down. Another clear glass is held in aluminum inner retainer and stays in fixed position to keep out flying particles. All glasses are replaceable without tools.

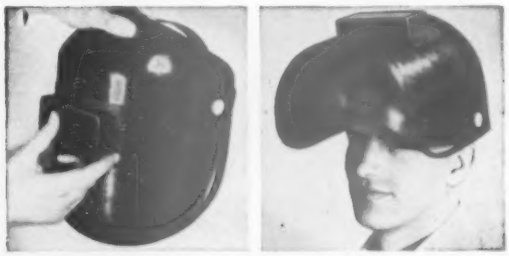
ARC WELDING HELMET
with Lift-Front ..... Type **H-2**

ON BOTH JACKSON HELMETS . . .

✶ **One-Piece Helmet Shell** is now made of a thermosetting plastic, reinforced with glass fiber, combining all the advantages of resistance to heat, moisture, high voltage and spatter with even greater strength, and even better appearance than before.

✶ **Headgear** has wider and more flexible straps for greater comfort, made of smooth plastic, easy to clean. There's no trial-and-error adjusting it to size. Calibrated to hat sizes in ⅛-inch increments, it is quickly made to fit before putting it on. The cork padded sweatband, held by snap buttons, is inexpensive to replace.

Try on either Helmet. You, like other weldors, will particularly like the Jackson-developed friction pivots. They are easily adjusted to your needs, by hand, from the outside, without taking the helmet off. The helmet can thus be made to float down without jolting stops, or to stay in any desired position. This unique feature eliminates the need for chin straps and other cumbersome inside gadgets.



Cover glass slides out without disturbing the filter lens . . . Plastic shell swings up on adjustable friction pivots.

Now—Lighter than Ever!

Jackson's *stationary-front helmet*, the first with a one-piece thermosetting plastic shell, is now, with its new, light metal lens holder, being made lighter than before.

With its new shell and improved headgear, it will win friends among weldors everywhere.

ARC WELDING HELMET
with Stationary Front.....Type **H-1**

Sold world-wide through distributors and dealers. Jackson Products, foremost makers of arc welding electrode holders, ground clamps and cable fittings, also manufactures a line of gas welding goggles, grinders' goggles, eye and face shields.

JACKSON
PRODUCTS
WARREN · MICHIGAN

HOBART

The "Business End"

of an arc welding ELECTRODE can affect the

"Profit End"

of your business

YES, your profits will go UP when ALL the conditions at the "Business End" of the Electrodes You Use are EXACTLY RIGHT!

EVERY STEP in the Production of HOBART ELECTRODES . . . chemical, metallurgical, and mechanical—is based on the objective of having ALL CONDITIONS in the welding arc just what they *should* be. Therefore, when you use HOBART ELECTRODES, you are sure of:

• SPEEDIER WELD PRODUCTION • DEPENDABLE WELDED JOINTS • MORE PRODUCTION PER OPERATOR PER HOUR • LESS WASTE DUE TO SPLATTER • LESS CHIPPING AND GRINDING AFTER WELDING • LOWER WELDING COST—PER POUND—PER FOOT—PER HOUR.

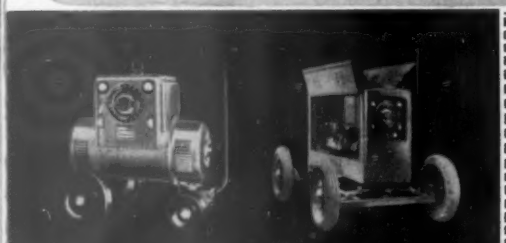
Further, a big, new, modern Electrode Plant now enables us to give far better deliveries than ever before.

Let us arrange for you to ***try out Hobart electrodes—in your own plant—with your own operators—without obligation.***

Hobart Brothers' New Electrode Plant

Write or Mail the COUPON for full information

"One of the world's largest builders of arc welders"



A complete line of ARC WELDERS

☐ **FREE**

"How to get better welds." Valuable new vest pocket booklet.

HOBART BROTHERS COMPANY, BOX U-83, TROY, O.

Without obligation, send information on items checked below:

☐ Electrode Catalog ☐ Electric Drive Welder ☐ Gas Drive Welder ☐ Pipeliner Welder ☐ Bantam Champ Welder. Send me ☐ Welder Catalog ☐ Accessory Catalog.

NAME_____ POSITION_____

FIRM_____

ADDRESS_____

HOBART ELECTRODES

FLOWLINE
TRADE MARK
WELDING FITTINGS
Stainless Steels, Monel, Nickel
BRING ALL THE ADVANTAGES
OF WELDED CONSTRUCTION
TO USERS OF
CORROSION-RESISTANT PIPING . . .
More than 3000 Stock Items
FLOWLINE Welding Fittings are stocked throughout the country by leading warehouses specializing in corrosion-resistant metals, in Schedules 10, 40, and 80 (Schedule 5 also available)—sizes ½ inch through 12 inches—in stainless steel Types 304, 316, and 347; Monel, Nickel, and Aluminum.
With FLOWLINE Fittings it is practicable for users of corrosion piping to obtain the fullest economy and efficiency of simplified welded construction—in design, installation, operation, and maintenance.
Welded construction provides greatest freedom in designing the layout. The system uses less space, is lighter in weight, and can be assembled and put into service faster. It is permanently leak-proof, has greater strength, longer life, and best flow characteristics.
FLOWLINE corrosion-resistant fittings include tees, stub ends, ells, reducers, and caps. All are made of forged or wrought metals, cold formed by our exclusive process and annealed, putting the metal in the best condition for corrosion service.
WELDING FITTINGS CORP.
NEW CASTLE, PENNSYLVANIA
World's Largest Manufacturer of Stainless Welding Fittings

THE WELDING ENGINEER

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VOLUME 38 NUMBER 8

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AUGUST, 1953

Cover: *Unique control tower at Phoenix airport looks like a standpipe. Details on page 36.*

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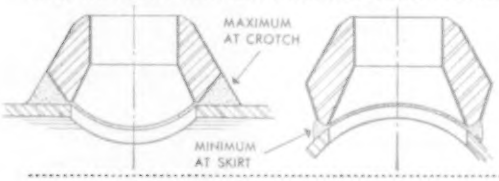
WELDOLET WELDING FITTINGS
MEAN PERMANENT PIPING
. . . PERMANENT SAVINGS

Here's Why

Every fitting is shaped to fit the pipe and is self-aligning.

The template is the inside of the fitting. The hole in the run-pipe can be cut out either before or after the fitting is installed.



Welded as indicated—to fill in 50° bevel at crotch, blending into 35° bevel at skirt—full reinforcement is accomplished.

The outlet is machine-beveled for quick, easy butt-welding of the branch pipe—shop or field fabrication.

Here's How

1. The WeldOlet is raised off the run pipe to establish proper weld gap, as required by Code for all types of branch connections. This is accomplished by placing spacers, e.g. welding rods, under the fitting.
2. The base joint is tack welded, preferably at four points, each half way between the crotch and skirt sections of the fitting. The spacers are then removed.
3. The stringer bead—or beads—is applied completely around the base of the fitting. The established weld gap assures full penetration.
4. Additional passes are applied as necessary to fill in the tapered base bevel of the fitting. The intermediate passes should not be continuous. Re-inforcing welds should be made at the crotch bevel area at each side of the fitting only. A continuous cover bead should be added, filling the bevel at the base of the fitting at the crotch and skirt sections.

TO COMPLETELY SAFEGUARD AGAINST:

- high pressures
- high temperatures
- internal corrosion
- external stresses

TO PROVIDE:

- improved fluid flow
- trouble-free and permanent piping systems

TO ACCOMPLISH ALL THESE THINGS IN THE MOST ECONOMICAL MANNER . . . SPECIFY AND USE

BONNEY WELDOLET WELDING FITTINGS

DISTRIBUTORS IN PRINCIPAL CITIES

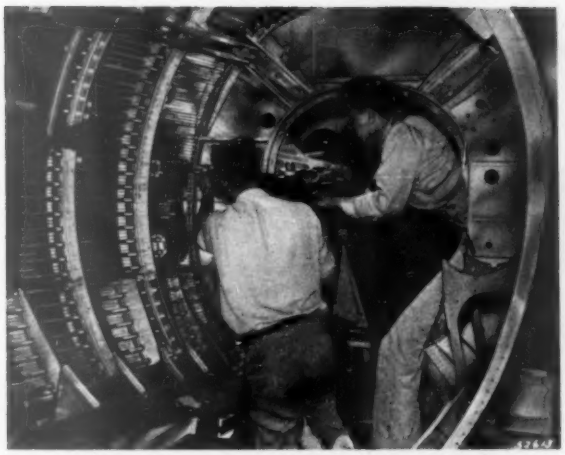
FOR COMPLETE ENGINEERING DATA WRITE FOR YOUR BONNEY W-3 WELDOLET CATALOG.

WELDING FITTINGS DIVISION

BONNEY FORGE & TOOL WORKS

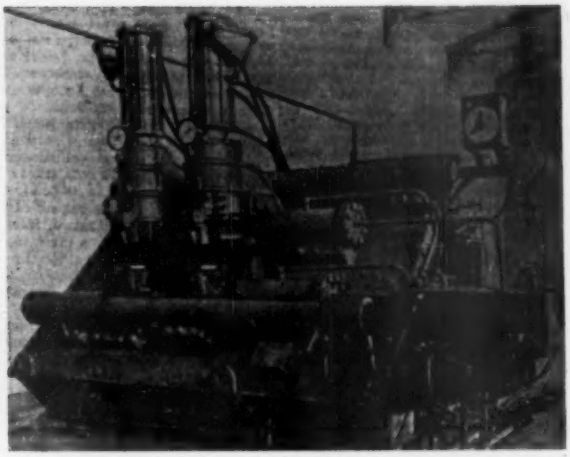
ENG. DEPT., 354 GREEN STREET

ALLENTOWN, PENNSYLVANIA



Courtesy Armco Steel Corp.

30,000 STRUCTURAL spot welds go into this 242-lb stainless nacelle (made by Solar Aircraft). It carries a 3,500 lb engine, one of two on the "Neptune" bomber



Courtesy McGraw-Hill World News

MONSTER rod welding machine made by the Russians is claimed to weld bars up to 4 in. in diameter. The rods go into reinforced concrete for a Volga river project.

NEWS

ODM Goals Revised on Welding Equipment

BOOSTS of four expansion goals in the metalworking equipment industry were announced in July by the Office of Defense Mobilization. These changes provide for increased capacity for the production of machine tools, miscellaneous metalworking equipment, metal cutting tools, and dies, jigs and fixtures. The four programs are to be completed by January 1, 1954.

A revised expansion goal for miscellaneous metalworking equipment was set at $46,760,000 of capital investment in added production capacity, an increase of $6,760,000 over the interim goal announced in August, 1952. This goal covers welding equipment, machine tool attachments and accessories, industrial heating equipment, gages and precision measuring instruments, rolling mill and wire drawing equipment, and foundry equipment and supplies.

A revised expansion goal for machine tools was established at $138,620,000 of capital investment in added production capacity, representing an increase of $7,620,000 over the previously revised expansion goal announced in November 1952.

Information regarding applications for certificates of necessity for rapid tax amortization under these goals may be obtained from the Metalworking Equipment Division of the NPA, Department of Commerce, Washington 25, D. C.

More Nickel-Stainless

Release of nickel-bearing stainless steel to manufacturers of paper, paper board and pulp machinery and equipment is permitted by an amendment to Schedule A of Order M-80 says NPA. The stainless will go into production of parts intentionally in contact with corrosive products.

The amendment also permits manufacturers of steam-jacketed kettle interior shells, pressure jackets, and fittings attached to them, to incorporate nickel-bearing stainless steel.

Section 4 of Schedule A is amended by the action to require that any person who orders nickel-bearing stainless steel, high-nickel alloy, or permanent magnets containing nickel, must certify to the distributor that the material will not be used in violation of Order M-80.

Russians Show Welder for 4 In. Bars

A BIG new automatic welder has been announced by the Russians in publicity concerning their Kuibyshev hydroelectric project on the Volga River. The welder makes continuous lengths of reinforcing rod for reinforced-concrete construction work. Capacity of the machine is said to be almost 4 in. diameter bars. It was built by the Leningrad Electric plant.

Plastic Welding School Started by American Agile

AMERICAN Agile Corporation of Bedford, O., has opened a welding school stressing welded fabrication of plastic piping and containers. A pioneer in the welding and flame-spraying of thermoplastics, American Agile will offer its experience to the students in lectures and lab courses. Subjects to be covered include plastic design, reinforcement problems and design as influenced by temperature and chemical conditions.

The school is open to all men who are interested in welding thermoplastics, especially polyethylene and unplasticized polyvinyl chloride. Complete details and information, together with a booklet identifying the various lecture, exercises and subjects is available from the company at P. O. Box 168, Bedford, O.

* * *

New Argon Capacity

AN expansion goal for argon calling for an annual capacity of 385,000,000 cu ft by January 1, 1956, has been announced by ODM.

Courtesy Chicago Bridge & Iron Co.

AUTOMATIC field welding machine makes girth joint on 120 ft diameter tank at Salt Lake City. See page 54

Courtesy R. G. Le Tourneau, Inc.

RUBBER-WHEELED train for carrying freight or raw material across desert or through jungle is all-welded

Lincoln Announces Division for Rebuilding Arc Welders

A NEW operating division established by The Lincoln Electric Co., Cleveland, will utilize latest manufacturing methods to rebuild arc welders. Called the "Linc-conditioning" division, it will utilize some $500,000 in space and equipment to rebuild welders in production lots, thereby assuring economies over "one-at-a-time" methods.

New machine guarantees will be placed on all welders that are "Linc-conditioned", according to Robert Dalzell, supervisor of the division. All parts of engines, motors, and generators will be completely disassembled, cleaned, stripped, checked for condition, rebuilt, reassembled and given standard factory final tests. Gasoline and Diesel engines will be rebuilt by standard factory methods by men trained in the manufacturer's plants. The division is tooled up to handle several hundred welders a month.

* * *

Acetylene By-Products Explored by Airco Chemical

RESEARCH on acetylene derivatives at Air Reduction Chemical Co., Bound Brook, N. J., new division of Air Reduction Co., Inc., has paid off in production of a series of four new alcohols and glycols previously unavailable in commercial quantities. They are methyl butynol, methyl pentynol, dimethyl hexynediol and dimethyl octynediol.

They are described as extremely promising intermediates in production of polymers, insecticides, fungicides and pharmaceuticals. Specific applications: Methyl pentynol is an active ingredient of a non-habit-forming sleeping compound; dimethyl hexynediol is an economical starting material for synthesis of a new insecticide (allethrin).

* * *

IAA Meeting Set for Next April 7-9

THE Palmer House, Chicago, will be the scene of the 1954 meeting of the International Acetylene Association. Sessions will be held Wednesday through Friday, April 7-9. Speakers are now being contacted for the program and suggestions are being sought for good plant inspection trips.

Only Six Materials Left on Scarce List

THE National Productive Authority, Department of Commerce, has trimmed its list of scarce materials to six items—diamond grinding wheels, chromium, cobalt, columbium-tantalum, molybdenum and nickel.

The new "Designation of Scarce Materials I" listing (DSM-1) shows 57 materials withdrawn from their previous identification as scarce materials. This extensive revision of DSM-1 reflects recent NPA decontrol actions, including the revocation on May 1 of the principal inventory controls, NPA Regulation 1 and CMP Regulation 2.

Rubber-Tired Train Shown by LeTourneau

THE "Tournatrain", a rubber-tired locomotive and freight car combination capable of practical operation over deserts or through jungles, may point the way for development of isolated mineral deposits. Developed under the direction of R. G. LeTourneau, the "Tournatrain" utilizes his "electric wheels", large pneumatic tires carrying within their rims an electric motor and reduction gears. Thus each wheel is self-propelled, deriving its energy from the Diesel-driven electric generator mounted on the locomotive. No brakes are needed since the motive power can be controlled to provide the same or better action.

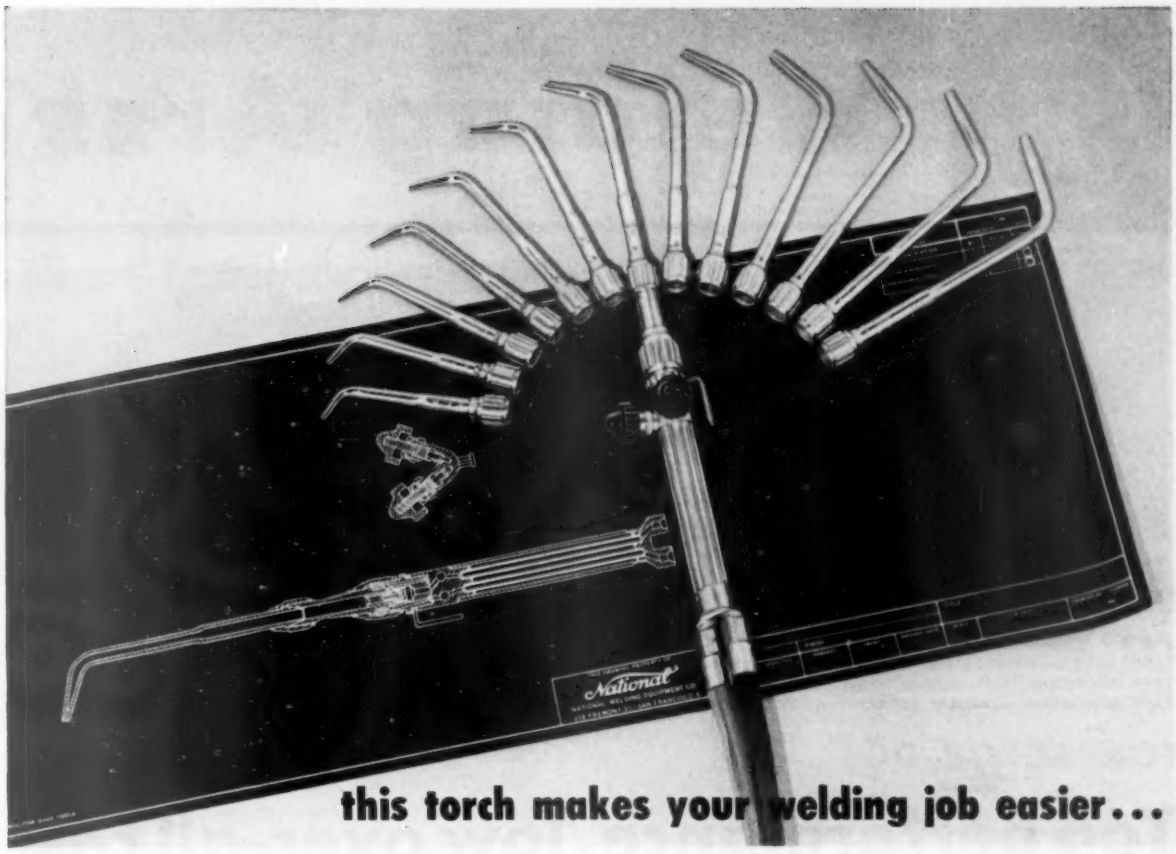
Each car is coupled to the car ahead so that it follows in the same tracks. The locomotive can pull up to a street intersection and make a right angle turn and every car will come up to the same spot and make the same turn. Most of the fabrication on locomotive and cars was accomplished by welding.

* * *

How to Use Sweatbands

To get the best results from cellulose sponge sweatbands, moisten them and squeeze dry before wearing, says American Optical Co.'s Safety Products Division. When dampened they have a greater capacity for absorption of perspiration and feel more cool and comfortable.

(More News on page 74)



this torch makes your welding job easier...

for aircraft parts and other light gauge metal welding nothing could serve you better...

and here are the definite reasons "why"

If you weld small aircraft parts, work on sheet metal or do any of a hundred odd things requiring expert care and delicate torch manipulation, this torch is made for you.

Light in weight, beautifully balanced to respond to your slightest touch, it offers you a choice of thirteen welding nozzles with finely graduated flame sizes.

Each nozzle is plainly marked both with number and drill size; this makes your nozzle and tip cleaner size selection easier.

Each nozzle is carefully polished and chrome plated to diminish slag adhesion.

The patented mixer sealing ring (first developed by NATIONAL) makes tight sealing an assured thing without use of wrenches; and you may turn the nozzle in any desired direction while welding.

For easier flame adjustment we chose large ribbed, color identified, plastic needle valve wheels; we used them for many years on tens of thousands of torches with wonderful success; they stay cool to your touch.

We provided an easily removable hook to hang the torch onto a gas saver . . . if you don't require it, lift it off the torch.

Really, you ought to try this torch . . . we promise you a pleasant experience.

Made by National SINCE 1910 WELDING EQUIPMENT CO., San Francisco 5, California

529

Welding Arcs

G-E MG WELDERS—half the size of other d-c welders of this type—offer a steady-arc interactor, single-dial dual control, easy inspection, wide current range, and high efficiency, for high production, operator satisfaction, low operating costs.

G-E AC WELDERS—best for 3 out of 4 jobs because of no arc blow—feature instant arc striking, steady capacitor-stabilized arc, exact current setting on the easy-to-read scale, high power factor for low-cost operation, and long-life silicone insulation.

FOR AC OR DC

Top performance, low over-all cost make G-E welders your best buy

G-E ENGINE-DRIVEN WELDERS—5 rugged types for every outdoor job—are powered by leading air- and liquid-cooled gasoline engines and diesels. Sturdily built to stand up in outdoor service, these units provide excellent welding performance.

Whatever the requirements of your welding job—whether it's AC or DC, indoors or outdoors—there's a General Electric welder available to give you unsurpassed performance. The features and operating benefits listed on this page can mean real savings for you during the long life of your G-E equipment.

You get more than just quality equipment when you buy G.E. Prompt shipment, application help, and complete service facilities provided by your local G-E Welding Distributor mean extra dollar savings for you.

For complete information on G-E welders and how they can help you do a better job at lower cost, contact your nearest G-E Welding Distributor today. He's listed here and in the classified section of your phone book under "Welding Equipment". General Electric Company, Schenectady 5, New York. 710-5

You can put your confidence in—

GENERAL ELECTRIC

News

Information on equipment, electrodes and accessories from G.E., pioneer in arc welding

New G-E electrode nomenclature will simplify selection, stocking, training

To simplify electrode selection, stocking, and training, which have been complicated by the large variety of electrodes manufactured today, General Electric has put into effect a new mild-steel and low-alloy electrode nomenclature system. This new system, closely tied to familiar AWS classifications, can be explained by a simple example:

The G-E electrode formerly known as W-28 is an AWS Class E-6012 electrode. Under the new G-E system, this electrode will be known as W-612A, formed by adding "W" to the basic 6012 and, for simplicity, dropping the "0". The "A" is used to differentiate between this electrode and two other Class E-6012 electrodes (formerly W-29 and W-20F) which will now be termed W-612B and W-612C. All other G-E mild-steel and low-alloy electrodes will be designated in a like manner.

During changeover to the new system, G-E electrode packages will carry both old and new numbers. Nomenclature of G-E stainless-steel and hard-surfacing electrodes will not be altered.

To familiarize yourself with the new G-E electrode nomenclature, ask your G-E Welding Distributor for a copy of GED-1634A.

Copyright 1953, G.E. Company

Joe Magee says . . .

New W-610A electrodes reported 8 ways better

User reports on General Electric's new W-610A electrode list 8 performance benefits of this outstanding Class E-6010 rod.

They say W-610A . . .

- is easier, faster to use
- is free of "wandering arc"
- eliminates pinholing problems
- produces lower-porosity welds
- stops "fingernailing"
- has a stable coating
- prevents excessive spatter
- makes slag removal easy

Find out for yourself

If you haven't discovered these benefits for yourself, contact your General Electric Welding Distributor today. He'll give you a free sample of G-E Type W-610A—the electrode that's fast becoming the quality standard for the welding industry.

FREE

Stainless-steel Guide

If you weld stainless steel, you'll want this new G-E Bulletin "Welding and Metallurgical Aspects of Stainless Steels". Written for both the novice and veteran weldor, this easy-to-read pamphlet is full of practical data to help you select electrodes, produce better welds, and avoid common problems in stainless-steel work. Ask your G-E Welding Distributor for Bulletin GET-1955.

Here's the name of your G-E Welding Distributor—

Alabama: Birmingham—Alabama Oxygen, Young & Vann Supply; Mobile—Turner Supply

Arizona: Phoenix—Consolidated Welding Supply

California: Fresno, Los Angeles, Oakland, Sacramento, San Diego, San Francisco, Ventura—Victor Equipment

Colorado: Boulder, Colorado Springs, Denver, Durango, Ft. Collins, Ft. Morgan, Greeley, LaJunta, Longmont, Pueblo—Hendrie & Bolthoff

Florida: Hollywood, Miami—Florida Gas & Chemical

Georgia: Atlanta, Macon—Welding Supply & Service; Augusta—Marks Oxygen; Columbus—Williams Welding Supplies

Idaho: Boise—Olson Manufacturing

Illinois: Chicago, Moline, Morton—Machinery & Welder

Indiana: Evansville—Drill Master Supply; Ft. Wayne, Indianapolis—Sutton-Garten; South Bend—Perry Welding Sales & Service

Iowa: Des Moines—Machinery & Welder

Kansas: Coffeyville—Thompson Bros. Supply & Welding Equip.; Hutchinson—Kopper Supply

Kentucky: Louisville—Reliable Welding; Paducah—Henry A. Petter Supply

Louisiana: Alexandria, Shreveport—Hughes Oxygen; New Orleans—Consolidated Welding Supplies

Maryland: Baltimore—Arcway Equipment

Massachusetts: Boston—New England G-E Welding Sales Division

Michigan: Detroit—Welding Sales & Engineering; Grand Rapids—Miller Welding Supply

Minnesota: Duluth—W.P.&R.S. Mars; St. Paul—Production Materials

Mississippi: Jackson—Jackson Welding & Supply

Missouri: Kansas City—Hohenschild Welders Supply; St. Louis—Machinery & Welder

Montana: Billings—Valley Welders Supply; Butte, Great Falls—Montana Hardware

Nebraska: Lincoln—Lincoln Welding & Supply; Omaha—Baum Iron

New Jersey: Kenilworth—Welding Sales

New Mexico: Albuquerque—Industrial Supply Co., Hobbs—Western Oxygen; Las Cruces, Silver City—Car Parts Depot, Inc.

New York: Buffalo—Welding Equipment Sales; Syracuse—Welding Engineering & Equip.

North Carolina: Charlotte—Dixie Gases; Gastonia—Gastonia Motor Parts

North Dakota: Bismarck, Fargo—Acme Welding Supply; Fargo—Dakota Electric Supply

Ohio: Akron, Cincinnati, Cleveland, Columbus, Dayton, Mansfield—Burdett Oxygen; Toledo—Odland Iron Works

Oklahoma: Tulsa—G-E Welding Sales Division

Oregon: Eugene, Portland—J. E. Haseltine; Medford, Portland—Industrial Air Products

Pennsylvania: Philadelphia, Pittsburgh—Arcway Equipment

South Carolina: Columbia, Greenville—Welding Gas Products

South Dakota: Deadwood—Hendrie & Bolthoff

Tennessee: Chattanooga, Knoxville, Nashville—Welding Gas Products; Memphis—Delta Oxygen

Texas: Abilene—M&M Welding Supply; Alice, Corpus Christi—Crane Welding Supply; Alpine, El Paso, Marfa, Pecos—Car Parts Depot; Amarillo—Tex-Air Gas; Brownsville, Harlingen—Acetylene Oxygen; Dallas—Hill Equipment & Supply; Hereford—Tex-Air Gas; Houston—G-E Welding Sales Division; Lubbock—Welders Supply of Lubbock; Midland—West Texas Welders Supply; Odessa, Pecos—Western Oxygen; Plainview—Plains Welding Supply; San Angelo—Southwestern Welding Supply; Snyder—Western Welding Supply; Texarkana—Hughes Oxygen; Wichita Falls—Nortex Welding Supply

Utah: Salt Lake City—The Galigher Co.

Washington: Seattle, Spokane—J. E. Haseltine; Spokane, Yakima—Industrial Air Products

West Virginia: Bluefield—Bluefield Supply; Charleston—Virginian Electric; Huntington, Logan—Logan-Hardware & Supply

Wisconsin: Milwaukee—Machinery & Welder

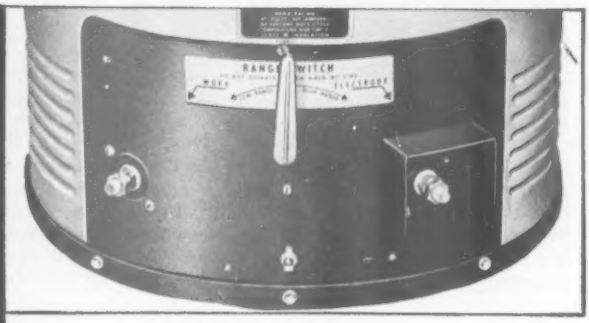
Alaska: Anchorage—Northern Supply

Canada: Toronto—Canadian G.E.

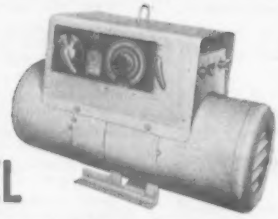
Hawaii: Honolulu—American Factors, Ltd.

NEW CONTROL SYSTEMS on M & T WELDERS for

GREATER ACCURACY and CONVENIENCE



ONE-DIAL DOUBLE CONTROL PANEL



eliminates plug-ins on **DC WELDERS**

New control system on all M&T DC Machines now makes regulation of welding current easy and positive! Simply set the electrode selector, then dial for required current . . . Welders are available in light-duty 200 amp and heavy-duty 200, 300 and 400 amp models — motor-generator or gas-driven.

RANGE SWITCH to SPEED RANGE CHANGING ON AC WELDERS

New range switch provides rapid changing from high to low or low to high range . . . No cable leads to unplug, no connections to make . . . Case mounted primary switch permits turning off welder to save current between welds . . . M & T AC Transformers, all silicone insulated, are furnished in light-duty 200 amp and heavy-duty, industrial ratings of 200, 300 and 400 amp.

Investigate these *improved* DC and AC Machines as well as M & T INERT ARC WELDERS and RECTIFIERS. They're all part of a *complete* line — second to none!

METAL & THERMIT CORPORATION

100 East 42 Street • New York 17, N. Y.

MUREX ELECTRODES • ARC WELDERS • ACCESSORIES

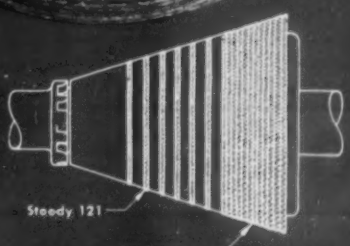
DETINNING
THERMIT WELDING
METALS and ALLOYS
ARC WELDING — Materials and Equipment
CHEMICAL and ANODES for Electrotinning
CERAMIC OPACIFIERS
STABILIZERS for Plastics
TIN, ANTIMONY and ZIRCONIUM CHEMICALS

When is it economical to

HARD FACE Crusher Mantles and Liners?

THERE's a right and wrong time to hard-face crushers. No equipment can be *economically* salvaged if too severely worn. *But you can increase service life 2 to 3 times for a modest cost if you don't delay too long!*

HARD-FACE WHEN NEW. Best time to hard-face is when mantles and liners are new or when wear patterns first develop. Build-up costs are then low. Repeat hard-facing as deposits wear away—and crushers will give many, many times ordinary service.



HINTS FOR AUTOMATIC WELDING:

1. When mantles are worn, rebuild with Steody Manganese.
2. Weld a few stringers of Steody 121 around upper portion of mantle.
3. Where wear is concentrated apply a solid layer of Steody 103.
4. If wear is extreme, weld Steody 103 over a layer of Steody 121.

See the STOODY GUIDEBOOK (available free) for manual rebuilding method. Your Stoody Dealer has a copy for you. Check the Yellow Pages under "Welding Equipment and Supplies."*

STOODY COMPANY
11941 East Slauson Ave., Whittier, Calif.

INCO ELECTRODES, WIRES, FLUXES

For Welding Monel · Nickel · Inconel and Cast Irons

NICKEL

Oxy-Acetylene	"41" Nickel Gas Welding Wire	For welding of Nickel—no flux required
Submerged Melt	"51" Nickel Wire	For welding Nickel
Inert Gas Metal-Arc	"61" Nickel Wire	For welding Nickel
Metal-Arc	"131" Nickel Welding Electrode D.C.	For welding Nickel or Low Carbon Nickel
	"141" Nickel Welding Electrode D.C.	For welding Nickel to steel; overlaying Nickel on steel

LOW CARBON NICKEL

Metal-Arc	"131" Nickel Welding Electrode D.C.	For welding Low Carbon Nickel

MONEL®

Oxy-Acetylene	"40" Monel Gas Welding Wire	For welding Monel using INCO "3" Gas Welding Flux
	"43" Monel Gas Welding Wire	For welding heavy sections of "326" Monel for acid pickling service—no flux required
Submerged Melt	"50" Monel Wire	For welding Monel
Inert Gas Metal-Arc	"60" Monel Wire	For welding Monel
Metal-Arc	"130" Monel Welding Electrode D.C.	For welding Monel
	"140" Monel Welding Electrode D.C.	For welding Monel to steel and overlaying Monel on steel

"K"® MONEL

Oxy-Acetylene	"44" "K" Monel Gas Welding Wire	For welding "K" Monel, using 2 parts INCO "2" or INCO "3" Gas Welding Flux and 1 part Lithium Fluoride
Inert Gas Metal-Arc	"64" "K" Monel Wire	For welding "K" Monel
Metal-Arc	"134" "K" Monel Welding Electrode D.C.	For welding "K" Monel

70/30 COPPER-NICKEL

Metal-Arc	"137" 70/30 Copper-Nickel Welding Electrode D.C.	For welding 70/30 Copper-Nickel

INCONEL® · INCOLOY®

Oxy-Acetylene	"42" Inconel Gas Welding Wire	For welding Inconel and Incoloy using INCO "2" Gas Welding Flux
Inert Gas Metal-Arc	"62" Inconel Wire	For welding Inconel and Incoloy
Metal-Arc	"132" Inconel Welding Electrode D.C.*	For welding Inconel and Incoloy; and Inconel and Incoloy to steel
	"142" 80/20 Nickel-Chromium Welding Electrode A.C.-D.C.	For welding Inconel and Incoloy to steel and overlaying on steel

INCONEL "X"® · INCONEL "W"®

Inert Gas Metal-Arc	"69" Inconel "X" Wire	For welding Inconel "X" and Inconel "W"
Metal-Arc	"139" Inconel "X" Welding Electrode D.C.	For welding Inconel "X" and Inconel "W"

CLAD STEELS

Metal-Arc	Nickel and Low Carbon Nickel-Clad	"141" Nickel Welding Electrode D.C.	For welding Nickel and Low Carbon Nickel side only
	Monel Clad	"140" Monel Welding Electrode D.C.	For welding Monel side only
	Inconel Clad	"142" 80/20 Nickel-Chromium Welding Electrode A.C.-D.C.	For welding Inconel side only

CAST IRON · DUCTILE IRON · NI-RESIST®

Metal-Arc	NI-ROD "55"® Electrode A.C.-D.C.	For welding Cast Iron, Ductile Iron, Ni-Resist, and other alloy irons to themselves and to other metals

FLUXES

INCO "1" Gas Welding and Brazing Flux—For welding and brazing copper-nickel and other copper alloys

INCO "2" Gas Welding Flux—For welding Inconel, all stainless steels, rustless irons and other chromium-containing alloys

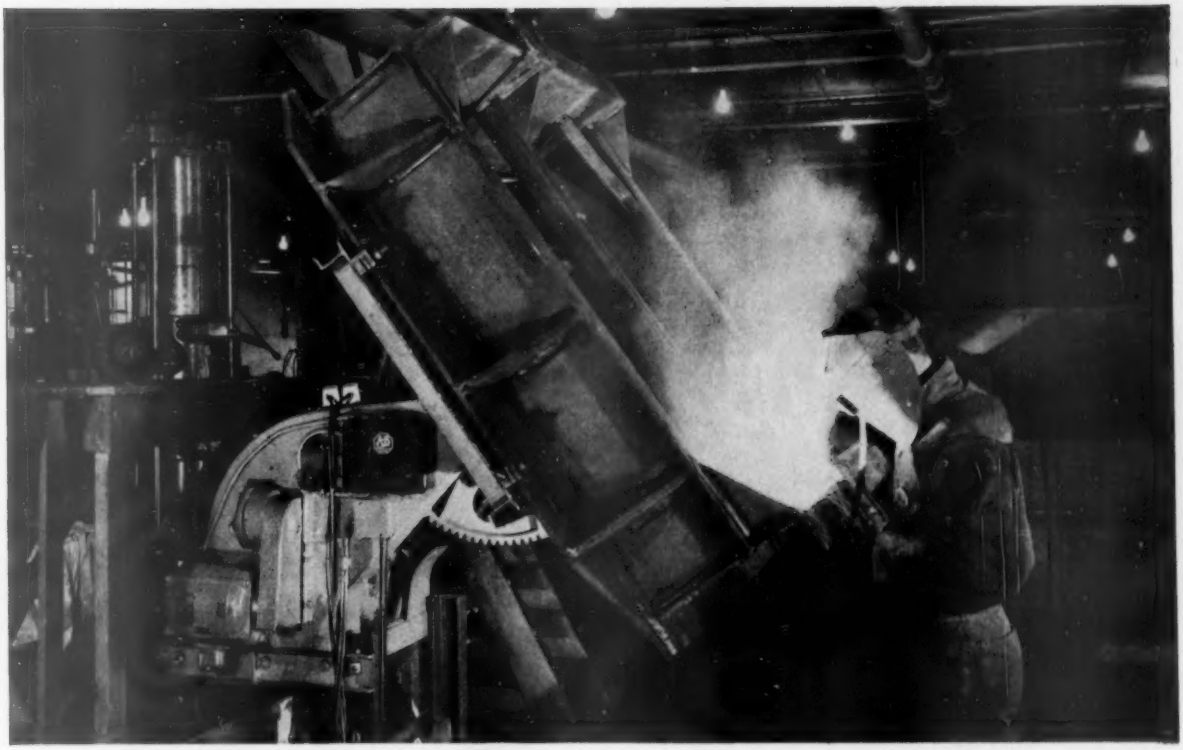
INCO "3" Gas Welding Flux—For welding Monel and other Nickel-copper alloys

*"132" electrodes larger than 3/32" diameter can also be used with A.C. transformers.

For further information, write for Technical Bulletin T-2 "Fusion Welding of Nickel and High Nickel Alloys."

Your Distributor of Inco Welding Materials can supply you with a copy as well as the latest information on deliveries.

The International Nickel Company, Inc.,
67 Wall Street, New York 5, N. Y.



WORTHINGTON WELDING POSITIONER ELIMINATES time-wasting handling of the work-piece . . . increases arc-time by tilting the work into position for continuous, economical downhand welding. Capacities from 100 lbs to 30 tons. Also: Turning Rolls from 3 to 150 tons, stationary and self-propelled.

A way to get more and better welding from your welders

Every minute your welders spend climbing, turning and propping is *lost* welding time.

Turn this waste time into *all arc-time* with Worthington Welding Positioners that tilt or turn all welds into position—*without delay*—for *continuous* downhand automatic or manual welding. Today's labor scarcity makes this increased production more important than ever.

These Positioners lower costs and boost production up to 50%. Downhand welding is *quicker* (only one pass instead of two or three) . . . *better* (deeper penetration with higher current, heavier electrodes, faster deposition of weld metal) . . . *neater* (weld metal levels itself). There's less rod waste, too.

Where can you see a Worthington Welding Positioner at work near you? Just write Worthington Corporation, Plainfield, N. J., for this information or for Bulletin 210D.

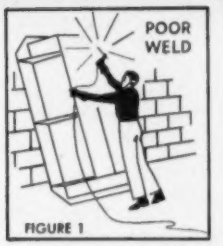


FIGURE 1

FIGURE 2

HOW WORTHINGTON WELDING POSITIONERS PRODUCE BETTER WELDS

When the welder has to climb over, prop or flop the work-piece, he may only be able to use downhand welding over a limited area (Figure 1). With a Worthington Welding Positioner, the work is continually tilted or rotated automatically into position for downhand welding (Figure 2).

WORTHINGTON'S UNIVERSAL TABLE TOP makes the Welding Positioner as profitable on job work as mass production. Those "T" slots make the table adaptable to any shape of work-piece and a wide range of sizes. No special jigs or fixtures needed.

Y.2.3

WORTHINGTON

Welding Positioners
Turning Rolls

You asked for it ...and..

YOU ASKED FOR...	miller GIVES YOU...
1 Wide current range for all types of welding from the thinnest gauge metal weldable to the maximum capacity of each welder.	Unprecedented current ranges ie; SR-200 (3-300 AMPS) SR-300 (3-400 AMPS) SR-400 (5-525 AMPS) SR-600 (125-750 AMPS).
2 Crater elimination.	Hand or foot remote control units permit crater elimination and micrometer amperage selection.
3 Range switching from convenience standpoint with simplified current control.	A new, conveniently located range selector switch and dual "Unitized" infinite current controls.
4 Instantaneous, convenient polarity reversal.	New, rugged MILLER designed polarity reversal switch.
5 High weld deposit rate.	* Time tested pulsating direct current due to MILLER'S unique electrical circuit.
6 Greater arc flexibility throughout entire welding range.	Magnetic amplifier circuit and new current stabilizing coils insure complete arc stability at all current settings.
7 Guaranteed rectifier performance.	Rectifiers specially designed for welding applications, thermostatically protected and warranted under a 5 year guarantee.
8 The BEST D. C. Arc Welder.	The new MILLER SR Welders—raising the standards for D. C. welding to a new high.

* Patented and patent applied for.

SINCE 1929 **miller ELECTRIC**

...here it is!

the NEW miller SR WELDER

4 Models — from 200 AMP to 600 AMP.

ARC-SPOT miller GENERATORS WELDERS

Following the familiar pattern of always leading the field in new developments and advanced design, MILLER scores again with the new SR.

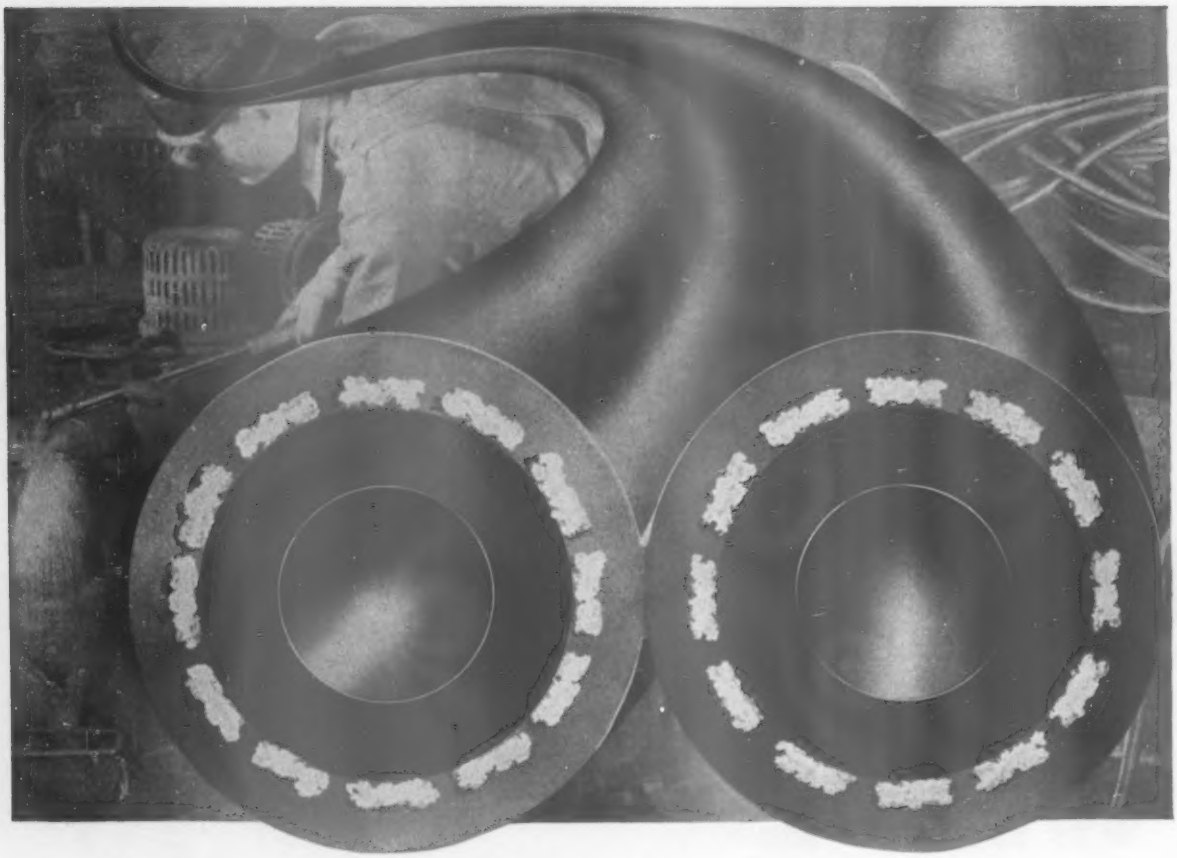
Incorporating ideas gained from extensive research and your field experience, the new MILLER SR welders represent the ultimate in D. C. welding.

Write

Why not get the complete story on the new SR welders . . . today!

See your MILLER distributor.

MANUFACTURING CO. APPLETON WISCONSIN



NOW BETTER THAN EVER

Hewitt-Robins Twin-Weld Hose Offers Values Found in No Other Welding Hose

Twin-Weld®—the original twin-line welding hose, preferred by over 7 out of 10 users—is now four ways better.

Twin-Weld is non-porous . . . it eliminates welding inefficiency, explosions and fires.

Twin-Weld has a greater ease of handling . . . eliminates tangling, assures flexibility. Twin-Weld has the important advantage of being a "straight-cure" hose; it won't snake.

Twin-Weld eliminates tangled lines. Its two lines are firmly bonded together, yet easily separated by cutting with a knife.

Twin-Weld Hose incorporates principles of construction and methods of manufacture which are exclusive with Hewitt-Robins. It is safer, longer-lasting and now has a new neoprene flame-resistant cover.

O.D.'s now conform to IAA specifications—7/16", 17/32", 19/32" . . . I. D.'s 3/16", 1/4", 5/16".

Get the facts about Hewitt-Robins Twin-Weld Hose. Write for Bulletin No. H-4a. Or contact your local Hewitt Rubber Distributor (see "Rubber Products", Classified Phone Book).

HEWITT ROBINS

Executive Offices, Stamford, Connecticut

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
FOREIGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, Paris, France • Robins Conveyors (S. A.) Ltd., Johannesburg • **EXPORT DEPARTMENT:** New York City.

Engineered FOR ACCURATE FIT-UP

THIS TUBE-TURN Welding Return is engineered for shape, size and wall thickness to simplify piping installation. It is forged by the only process that produces a wall as uniform in thickness and true in circularity as the original seamless pipe. This assures accurate fit-up and perfect alignment . . . whether it is used as a full 180° return or cut to any odd angle.

When you specify TUBE-TURN Welding Fittings and Flanges, you are *sure* of getting the ultimate in piping simplicity, safety and permanently leakproof construction. Your nearby TUBE TURNS' Distributor is at your service!

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York · Philadelphia · Pittsburgh · Chicago · Houston · Tulsa · San Francisco · Los Angeles · Denver · Atlanta

Subsidiaries: TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO • PENNSYLVANIA FORGE CORPORATION, PHILADELPHIA, PA.

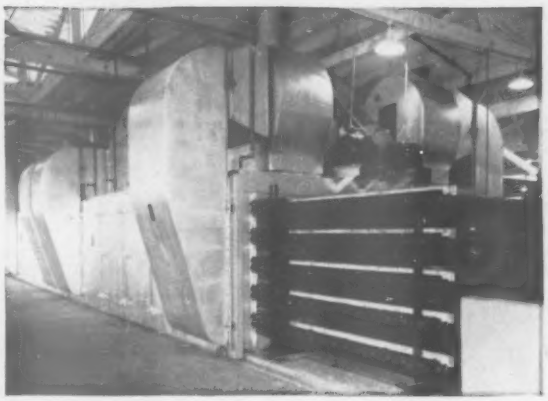
HERE'S SERVICE

TUBE TURNS' *Engineering Service*
HELPS IMPROVE A DRYER DESIGN

C. B. McLaughlin, manager of TUBE TURNS' Engineering Service Division has been working with designers and piping men in the field for years. He and his men are at your service.

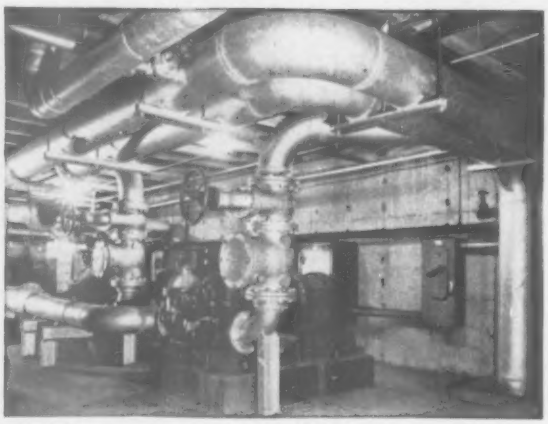
WHERE PIPING is a component of plant equipment, more and more designers are using TUBE-TURN Welding Fittings for directional changes. Results: greater design flexibility, reduced maintenance, less weight and space, improved operation. An example is the veneer dryer shown . . . a product of Coe Manufacturing Company, Painesville, Ohio. Progressive engineers of Coe, with the help of TUBE TURNS' Engineering Service Division, converted the heater from screwed connections to welded construction. Each of its banks of 1-inch pipes is joined by 180° TUBE-TURN Welding Returns. The coils carry steam at 200 psi pressure and 388°F. Joints are now permanently leakproof.

TUBE TURNS' Engineering Service is available to help in *your* piping problems.



Coe Veneer Dryer. Welded coils with TUBE-TURN Welding Returns are compact and permanently tight.

YOUR DISTRIBUTOR of TUBE-TURN Welding Fittings and Flanges can serve you promptly. He is backed up by the entire TUBE TURNS' organization.



COMPACT. Welded piping nests together . . . saves space. These condenser lines are for air conditioning system at Lazarus Department Store, Columbus, Ohio.

Want Materials Data?

Tube Turns, Inc. has prepared a booklet listing properties and specifications of pipe and fitting materials—carbon steels and wrought iron; stainless steels; nickel and nickel alloys; etc. For a free copy just send this coupon.

TUBE TURNS, INC., Dept. N-8
224 East Broadway • Louisville 1, Kentucky

Your name .....

Position .....

Company .....

Nature of business .....

Address .....

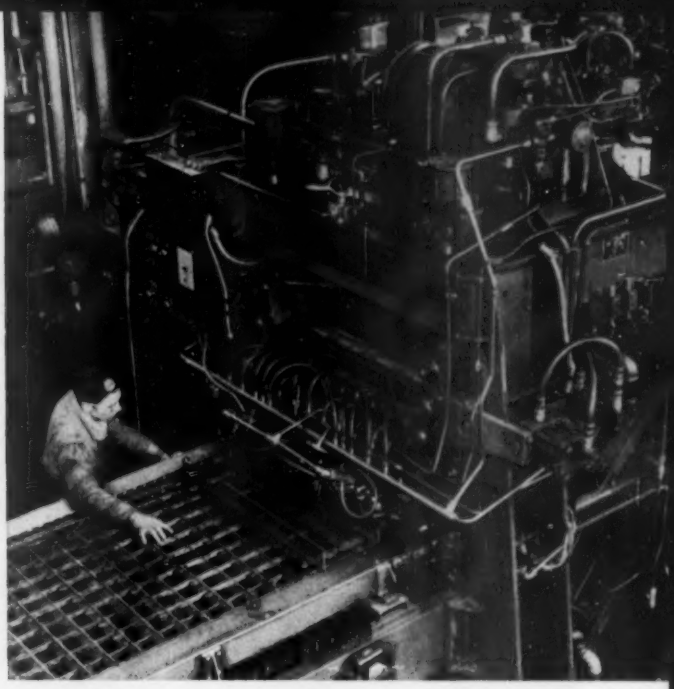
City ..... *State* .....

DISTRICT OFFICES

New York	Tulsa
Philadelphia	San Francisco
Pittsburgh	Los Angeles
Chicago	Atlanta
Houston	Denver

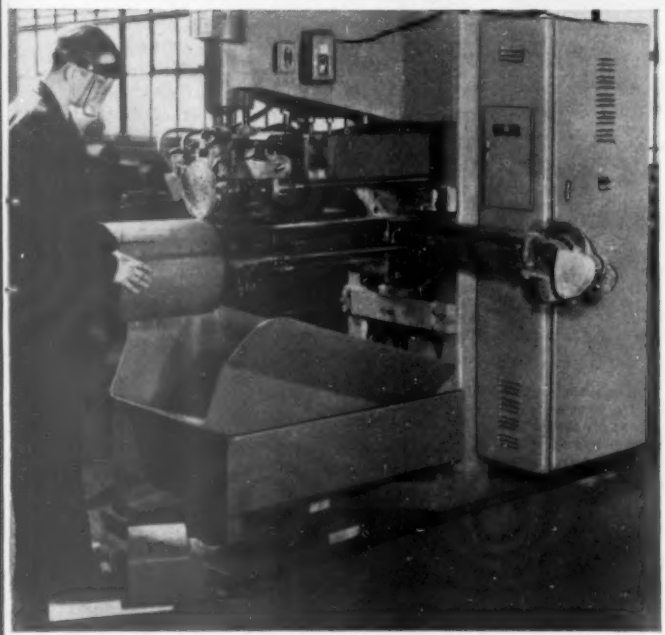
"TT" and "TUBE-TURN" Reg. U. S. Pat. Off.

TUBE TURNS, INC.
LOUISVILLE 1, KENTUCKY



TINY DIODES OR GIANT LANDING MATS . . .

G-E Resistance Welding Controls Cut Rejects, Speed Production



COMPLETE LINE of G-E control includes synchronous-precision, nonsynchronous, three-phase, and all special-purpose accessories for all standard spot, seam, combination, or bench welders.

One manufacturer welds delicate germanium diodes so tiny that operators look through magnifying glass to see them (above, left). Another fabricates huge landing mats with a giant multiple-electrode welder (above, right).

BOTH MANUFACTURERS use General Electric controls, as do hundreds of other metal fabricators.

NO MATTER WHAT materials or product you're welding—whether accuracy or speed or a combination of the two is your major requirement—specify G-E control on your resistance welding equipment.

FOR MORE INFORMATION, contact your nearby G-E Apparatus Sales Office or your welding machine manufacturer or his agent, or write:

Section E785-5, General Electric Company
Schenectady 5, New York.

Please send Bulletin GEA-5816, "The Story of Resistance Welding," which gives the how's and why's of resistance welding and a description of G.E.'s complete line of controls.

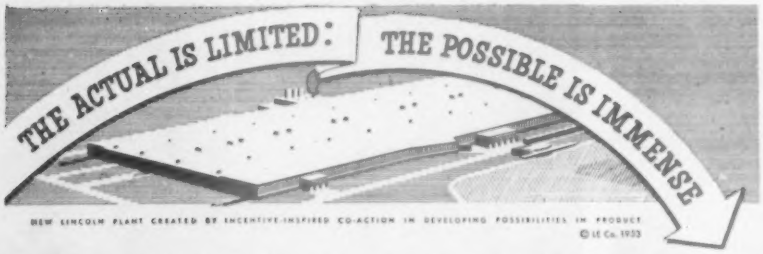
NAME_____ TITLE_____

COMPANY_____

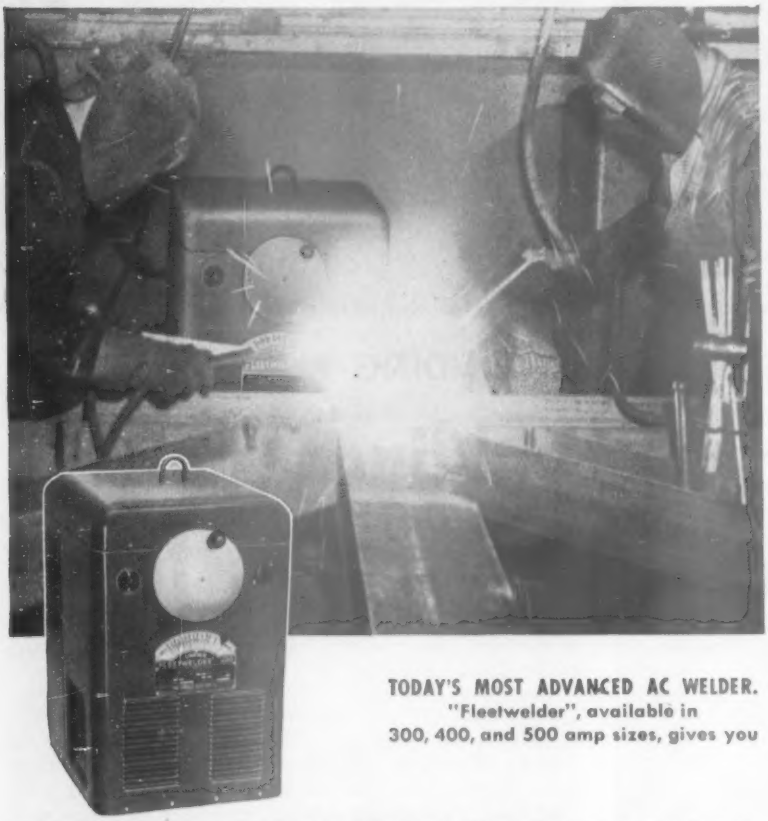
ADDRESS_____

CITY_____ STATE_____

GENERAL ELECTRIC



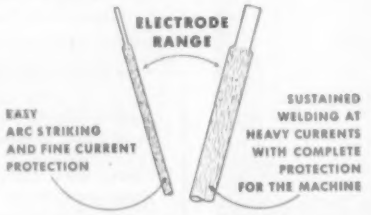
NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT
© LE Co. 1953



TODAY'S MOST ADVANCED AC WELDER.
"Fleetwelder", available in
300, 400, and 500 amp sizes, gives you

EXTRA RANGE TO SAVE EXTRA DOLLARS
on light and heavy work

LOOK at the sketch. It shows *how* you benefit through "Fleetwelder's" wide current range in which maximum welding currents are 15 times minimum current values.


ELECTRODE RANGE
EASY ARC STRIKING AND FINE CURRENT PROTECTION
SUSTAINED WELDING AT HEAVY CURRENTS WITH COMPLETE PROTECTION FOR THE MACHINE

This *extra range* teamed with "Fleetwelder's" exclusive "Arc-Booster" insures fine currents *with instant arc striking* for light gauge jobs while with the same welder you have ample amps for sustained welding at high currents.

No other AC welder offers this cost cutting combination . . . and at such low cost.

INVESTIGATE "FLEETWELDER" TODAY— See what new advancements in faster, more efficient welding are being put to use by Lincoln to simplify and speed your operations and cut your welding costs.

SEND FOR FREE BULLETIN 1314 on *"Fleetwelder". Available by writing on your letterhead to Dept. 1708.*

THE LINCOLN ELECTRIC COMPANY
CLEVELAND 17, OHIO
THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

11 WAYS to cut AC welding costs

DESIGNED for faster, simpler, more efficient welding, Lincoln's "Fleetwelder" saves money on every AC job. Here's how:

1. SELLS FOR LESS—Built with Lincoln incentive production methods, "Fleetwelders" low selling price gives *more range, longer service, easier, faster operation, greater dependability* for the dollar . . . to cut your AC welding costs.

2. Complete Overload Protection—Built with *generous* reserve capacity for long sustained output at high currents, "Fleetwelder" is *completely protected* against damage due to overheating *by a thermostatic controlled magnetic starter* . . . a feature exclusive with Lincoln.

3. Exclusive "Arc-Booster"— Pioneered by Lincoln, the exclusive "Arc-Booster" blasts the end of the electrode with extra amps for an instant when the electrode touches the work to start the arc automatically. Ideal in out-of-position welding.

4. Completely Safe—No high frequency devices as on some welders to help arc starting. Open circuit voltage is only 71 volts. Output terminal panel recessed to eliminate accidental shorting of leads.

5. "Low Voltage" Safety Relays available for special work. (Optional extra.)

6. Takes Less Power— "Fleetwelder" draws less amps in idle current than required for other AC welders. Inbuilt power factor is higher. Has pilot light to indicate power is on.

7. Low Maintenance—Ventilated from the top, "Fleetwelder" operates cleaner . . . needs less attention. Coils are permanently anchored, cannot become loosened to wear the insulation and short out. Easy accessibility to all working parts.

8. Current Stays Set—Once set, current settings do not change . . . are "locked" in position by rugged drum type holding devices. Illuminated dial shows setting of welding current.

9. Steady Arc—"Fleetwelder's" reactor control is a free circuit designed for high responsiveness to changing arc conditions.

10. Compact, Portable—Only 35″ high, 22″ x 26″ at base, "Fleetwelder" requires less space. Has connection for simple hookup to 220 or 440 volt line. Can be furnished with three wheel undercarriage for moving around the shop.

11. Instant Penetration—The extra current for arc striking also gives *complete penetration* at once . . . no more cold overlaps or partial penetration at the start of the weld.

ESTABLISHED 1916

THE WELDING ENGINEER

AUGUST, 1953

Wanted: Education for Educators

ACCORDING to the Thorndike-Barnhart pocket dictionary on my desk, education is: (1) training; schooling; (2) the knowledge and abilities gained through training. I would define it in another way: Education is knowledge—including the knowledge of how to find out the things you don't happen to know.

You can become educated without formal schooling by working with a subject. If you keep your eyes and ears open, a certain amount of knowledge will "rub off" and be ore long you will not only know something about the subject but also where to find the information you don't have.

By this yardstick, not many people are educated where welding is concerned. In some instances, the lack of education applies even to those who daily work with welding.

Without welding, we would not have—at least not at today's prices—automobiles, automatic washers, airplanes, radios and innumerable other products that make life easy and pleasant. Because welding is so important to everyday living, you would think that almost everyone would know something about it. It's simply not true. To the average man, welding is something done at the corner garage. "It's not too reliable either," he will confide to you. "My bumper broke off again when the car went through the garage wall."

MAYBE the job of educating all of the public as to what welding is and its advantages is a job too big for the resources of our comparatively small industry. But there is a job that we can do and that is "to educate the educators," to borrow the happy phrase coined by Professor Richard C. Wiley in his talk before the Houston AWS meeting.

During recent months I have visited a number of engineering schools. I always ask the Dean what his school is doing in welding. Nine times out of ten, he has to think for a minute. Then his face brightens, and he replies, "Oh, we have a welding machine out in the shop."

You can count on the fingers of one hand the universities and colleges who are giving a real education in welding. If you count those who give a degree in welding engineering, you will have fingers left over.

How are the engineers and designers of tomorrow to learn about the advantages of welding? Who is going to tell them that welding is the only way to get a homogeneous joint that is actually stronger than the metals being joined? Who is to emphasize that fabrication by welding results in a product that is stronger, lighter in weight, more pleasing in appearance and generally less costly?

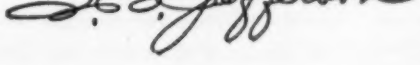
We who are interested in the growth of welding have a job to do. We must educate the educators of our engineers of tomorrow.

A LOT of other people should also be educated to get their thinking straight. As the saying goes, they should "Accent the positive." As an example of what I mean, a group of metallurgical researchers were discussing ship failures in a technical session open to the public. A newspaper man happened to wander in, yawned and was about to wander out again when he heard a statement that he could understand. Someone had happened to mention that 15 welded ships had failed, though no mention whatsoever was made of the fact that 5,000 welded ships didn't fail. Our newspaper man, not knowing the latter important fact, wrote a story headlined: "Welded Ships Fail." Thousands of readers were given a prejudice against welding.

Code writers often take a negative attitude, too. In striving for an impossible degree of perfection, they often hamstring welding with unworkable restrictions. As an example, a spot welder on one job is required to be requalified after making six welds. This could easily mean that the welder must be requalified after working less than a minute.

It is strange how welding is tied up with red tape on the simple jobs but found perfectly acceptable when the going is really tough. Examples are the high-temperature, high-pressure lines of steam plants, high-pressure cracking stills and refinery equipment and atomic research plants. In places like these, they use welding and think nothing of it.

Let's not worry about welding being able to do its job. Let's do our job of telling the welding story.



You can make high quality welds, quickly and easily, in stainless, aluminum, cast iron, HASTELLOY and MULTIMET alloys—practically all commercial metals—at lower cost with the 300 amp. HELIARC HW-10 water-cooled torch.

You'll find that the improved water-cooling system assures cooler and more effective operation even when the torch is used continuously at the full rated capacity. The cooling water flows through the power cable and torch body down to the water jacket and gas cup. The return flow follows the same route in reverse. All exterior "plumbing" has been eliminated allowing more maneuverability and preventing leakage due to accidental damage. Water-cooling makes lightweight torch construction possible, and because the power cable is also water-cooled, it too, is lightweight and easy to handle.

The HW-10 was designed so that the water passages are accessible and easily cleaned.

Electrodes are easily adjusted on the HW-10. A quarter turn of the torch cap releases the electrode for adjustment or replacement. You need no wrenches or other tools. In addition, electrode stub loss is reduced by placing the water-cooled electrode holder much closer to the arc.

Are you getting the best possible results from your present welding apparatus? Developments in the inert gas welding field have been so great and have come so rapidly that torches over four or five years old are now obsolete. Be sure that you have the highest production at the lowest cost. Modernize with the 300 amp. HELIARC welding torch.

Your local LINDE representative would be happy to give you more detailed information on the HELIARC HW-10.

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We'll All Remember Houston!

Yes, Houston was hot! But so was the Welding and Allied Industry Exposition of the American Welding Society. Attendance beat the 800 mark at this big event.

BY CLYDE B. CLASON

WITH water at perfect swimming temperature, the Shamrock's famed 165-ft-long outdoor Olympic pool vied with technical papers, plant tours and product exhibits as a convention attraction. But the cement walks from dressing room to pool side blistered the feet of the unwary who neglected to wear shoes. For Houston was in the grip of a heat wave.

The Texas metropolis had chalked up 25 consecutive days of 90-and-better weather by the time the American Welding Society's Spring Technical Meeting ended on June 16. But who cared? Outside might be like a fiery furnace, but the Shamrock and neighboring Hall of Exhibits were both beautifully air conditioned.

An International Affair

Despite gloomy forecasts, this was a well attended show. Total registrations had passed the 800 mark as of Friday morning. And it is interesting to note that not much more than 30% of the total were from Texas and the bordering states of Louisiana, Arkansas and Oklahoma. The rest came from all sections of the United States and from Canada. California was well represented and so were the Midwest and the Atlantic Seaboard. This was a truly national or, more accurately, an international welding exposition. Among cities represented on the registration list, we found:

Pieksämäki and Helsinki, Finland; Vienna, Austria; Oslo, Norway; Copenhagen, Denmark; Yokohama, Japan; Baden, Switzerland; Lisbon, Portugal; Ghent, Belgium; Milan, Italy; Paris, France; Nymegen and Rotterdam, Holland; Munich, Düsseldorf and Nuremberg, Germany; London and Croydon, England; Monterrey, Mexico, and Manila, Philippine Islands.

The industry's first all-welding show was staged conveniently adjacent to the hotel proper, a welcome innovation from past shows. The 76 exhibitors represented a fair cross-section of the products, equipment and supplies sold to the welding industry. Scanning the booths for new developments, we noted:

Fine-wire welder: New Mig (metal inert gas) welding equipment with a welding gun capable of handling fine wire down to 0.030 in. The new 450-amp welder power source has a low open-circuit voltage with a rising characteristic; *i.e.*, as more current is produced the voltage rises instead of drops. This makes the welding self-regulatory and suitable for thinner sheet stock than has ever been welded by the Mig process. The equipment, we were told, has been used successfully to weld 0.040 in. to 0.040 in. aluminum sheets. Experimental welds have been made using electrode wire as fine as 0.015 in.

Pipe-welding machine: Also for Mig welding was an aluminum pipe-welding machine that stopped automatically at the completion of each weld. The experimental model that was being demonstrated (product is not yet available commercially) welded a 6-in. OD pipe in 17 seconds.

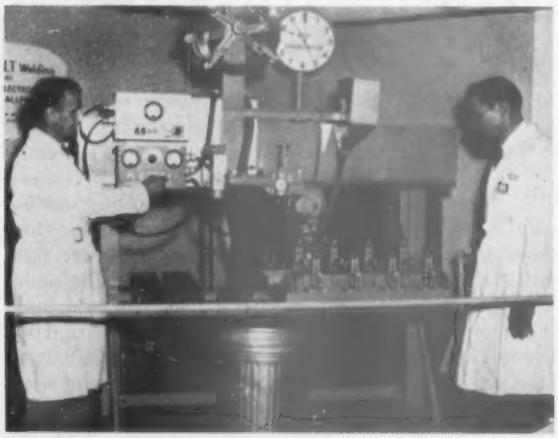
Vibrationless welder: Coins were stood on edge on top of the case of a 300-amp d-c rectifier welder. With the welder running at 75 amp, the two coins did not topple. Nor were they glued in place, as your reporter can testify from personal inspection.

Multiple-electrode submerged-arc welding: This type of equipment has made a successful transition from the laboratory to the market place. The electrodes (either two or three may be used) can be arranged one behind the other along the direction of welding (tandem position) or side by side in a line at right angles to the welding direction (transverse position).

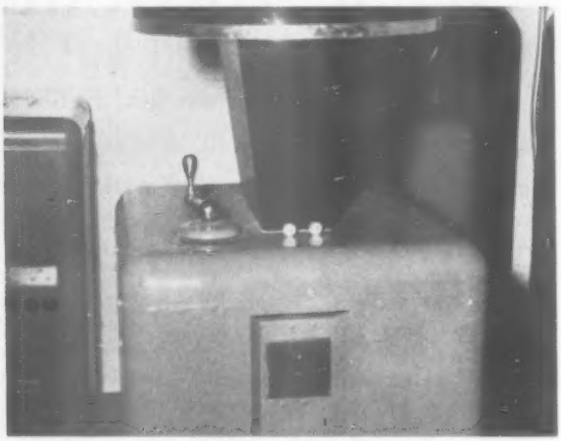
. . . . . Seen at the Welding Show

AWS President Fred Plummer holds key to Shamrock while George Kesseler, Houston's mayor pro tem, flame-cuts chain across entrance to show. Ben Allen at right

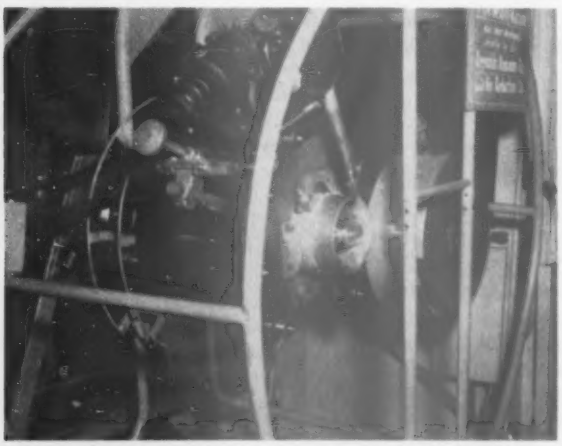
DICK Sager, research laboratories, Aluminum Co. of America, conducts a demonstration of new "fine-wire" metal-inert-gas equipment for welding thin sheet stock



MULTIPLE-electrode submerged-arc welding with wires in the side-by-side position is being demonstrated by Linde technicians G. R. Krois (left) and R. W. Johns



NICKELS remained on end the entire day and didn't roll while this 300-amp d-c rectifier welder was being demonstrated. The coins weren't glued in place, either



AUTOMATIC welding of aluminum piping. This device is so new that there is only a laboratory model. It took only 17 seconds to make a circumferential weld

PRETTY visitor to Resistance Welder Manufacturers' Association booth is Mrs. Bryan Graves, Houston section, who ran the message center for the welding show

With parallel power connection, the transverse position makes extra-wide welds suitable for spanning the gaps found in poor fit-ups. With series connection, the welds are both wide and shallow. Since there is little dilution of the applied metal, the transverse-series combination is particularly suitable for surfacing and cladding. With electrodes in the tandem position, welds can be made at three or four times the speed of single-electrode submerged-arc welds.

Hughes Does Its Bit

A most interesting plant tour took a busload of conventioneers through the many buildings of the Hughes Tool Co. Though Hughes manufactures only rock bits, core bits, core barrels and tool joints, its sprawling plant covers 75 acres and employs 4,500 persons. The rock bit is the bread-and-butter item of the Hughes Tool line. Basic parts are three head sections and three cone sections. The heads support the cones, which are covered with several rows of sharp chisel-like teeth. A special tungsten-carbide compound of near-diamond hardness is welded to the striking surface of each tooth.

The hardfacing material is applied by two different methods. On teeth designed to drill the softer rock formations, a sweat-on method is used. A waterglass solution is brushed on the teeth to hold the tungsten-carbide particles in place while they are fused or "sweated" to the teeth with an oxyacetylene torch.

Bits that drill the harder rock must have more hardfacing. For such bits, the teeth are hardfaced by using an atomic-hydrogen torch with a tubular filler rod. The rod has a mild-steel sheath that holds the tungsten-carbide particles. After all assembly operations on a rock bit have been completed, arc welding is employed to join the three sections of the rotary bit together. A special flash-welding process is employed to join tool joints — threaded connections — to 40-ft lengths of drill pipe.

Captain's Dinner

Another plant tour was made to the A. O. Smith Corp. of Texas, which manufactures internally expanded welded steel pipe up to 36-in. diameter. The 40-ft sections are flash welded along the entire longitudinal seam by equipment that uses up to 1,000,000 amperes.

For an all-time good time, nothing will ever surpass the tour and dinner combination that was Thursday's offering to the crowded convention calendar. Six busloads of AWS members and their wives set out from the Shamrock. The ladies, their husbands and many single men, too, were then transferred to a boat. The male leftovers, reduced now to two buses, were driven along the Houston Ship Channel to the 570-ft spire that marks the site of the Battle of San Jacinto. In case your Texas history is as rusty as mine was, Santa Anna was defeated and captured in this battle, Sam Houston won everlasting fame and Texas won her independence. After an elevator ascension to the observation level of the monument, the visitors were driven down to board the Battleship *Texas*, which has found a permanent berth off the Houston Ship Channel after serving in two world wars. An outdoor cocktail party was held in the shadow of the *Texas*, in front of the San Jacinto Inn. This pleasant affair was followed by a gigantic "Captain's Dinner" in the inn's main dining room. Menu: shrimps, cracked crab, deviled crab, fried sea trout, fried chicken, coffee and ice cream. Tremendous platters of crab and shrimp greeted the diners on their arrival at the tables. It was a meal in the true Texas tradition of lavish hospitality and was rendered even more enjoyable by the music of Tony Martin's Townsmen Quartet.

A great big hand should be given to S. C. Hamilton, Chicago Bridge & Iron Co., Houston, and James Earthman, Wyatt Metal & Boiler Works, Houston, the dinner co-chairmen responsible for this unforgettable evening. While we are on the subject of credits, tribute must be paid to Ben H. Allen, Mosher Steel Co. and William H. Greer, Southwestern Laboratories, chairman and incoming chairman, respectively of the Houston section. These men worked hard to see that everything ran smoothly. And all of the local arrangements committees did such a good job that complaints were rarely heard. Houston committee chairmen were: H. V. Mosby (hospitality), A. E. Wisler (housing), J. A. Zwerneman (ladies' entertainment), P. D. Morgan (meeting sessions), L. F. Megow (plant visit), F. H. Berry (publicity), W. C. Cox (signs), W. G. Gumm (technical services) and Hal Cogswell (ticket sales).

R-W Symposium

Dr. Robert C. McMaster and his "blue-sky" dreaming stole the show at the all-day symposium on resistance welding. And McMaster wasn't even on the program since he was pinch hitting for a colleague, R. P. C. Rasmussen (both of Battelle Memorial Institute, Columbus, O.). In the short time of 15 minutes, Dr. McMaster had sparked with enough unconventional ideas on instrumentation "to keep us busy for the next ten years," as one enthusiastic member of the audience phrased it.

The ideal method, McMaster began, would be to measure the cast-metal structure of the spot weld *while it is being formed* and then control the formation by a feedback system that is sensitive only to the end product. Unfortunately, there is no known method of looking inside a spot weld while it is being made, so we are forced to fall back upon indirect methods. We usually measure the current, force and time and assume that all of the other variables affecting weld quality will be under control.

McMaster advocates a study of analogue computers and feedback systems generally in order to discover improved methods for monitoring resistance welders. One specific idea he suggested was to photograph oscilloscope traces that were made under ideal welding conditions. The resulting photographic negative could then be mounted in proper position over the end of the cathode-ray tube so that light would show through only when the ideal conditions of current, force and time were being met. This principle, declared McMaster, can be applied to actuate a photoelectric cell to sound an alarm whenever welding conditions wander from the ideal set-up.

A similar idea was the "photoformer." In this case, waves of the ideal shape for the production of a particular weld may be cut out of cardboard and mounted on the end of the cathode-ray tube of the oscilloscope.

Other speakers on instrumentation were C. R. Rixon, Aluminum Co. of America, and C. B. Smith, Douglas Aircraft Co. Mr. Dixon's topic was the need for improved instrumentation, while Mr. Smith revealed what the Douglas plant at Long Beach, Calif., is doing.

Also on the morning session, W.

J. Wilson, Kaiser Metal Products, Inc., Bristol, Pa., discussed welding techniques and schedules. A recent survey of aluminum spot-welding practices, he said, indicates that the "narrow range" is very much wider than that commonly accepted by industry. It was discovered that there was little similarity of practice in welding schedules submitted by many industries—a definite indication that most aluminum alloys can be welded over a wider range of machine settings than has been deemed possible.

Briefer talks on various phases of resistance welding were contributed by E. B. Morris, Grumman Aircraft Engineering Corp.; A. J. Rosenberg, General Electric Co.: R. P. Becker, International Harvester Co., and M. L. Ochieano, Lockheed Aircraft Corp. This quartet of experts acted as moderators during the morning session of the symposium.

Floyd H. Matthews, assistant tool design engineer, Boeing Airplane Co., Seattle, opened the afternoon session with a talk on quality control in the spot welding of aluminum. Proper maintenance of a resistance welder, he asserted, requires the isolation of the *real* cause of the trouble and the application of the *correct* remedy instead of the juggling of component parts to effect a makeshift repair. Applications of quality control to aircraft were covered by D. O. Samuelson, Solar Aircraft Co., for stainless steel and by C. B. Smith, Douglas Aircraft Co., for aluminum.

Another quartet of moderators also contributed to the afternoon session: Wilson Scott, Westinghouse Electric Corp.; Harold Robinson, Kaiser Aluminum; J. B. Houston, Intercontinental Mfg. Co., and Frank G. Harkins, Solar Aircraft Co. A surprising bit of information was thrown into the discussion by Moderator Harkins. The spot-welding control system at Solar's San Diego plant cost $13,000 for 150 spot welders during the month of May. Quality control of spot welds has become almost prohibitive for smaller companies engaged in aircraft work, Harkins opined.

About Human Beings

The human element is a topic all too often neglected at welding technical meetings. Not here. Excellent talks on this phase of welding activities were given by David P. O'Connor, Richard C. Wiley and Hans Vinter.

Mr. O'Connor, who has been with the Department of Water and Power, City of Los Angeles, for 23 years, began with the story of the sick man whose doctor prescribed two aspirins and a slug of whiskey daily. Like that invalid, our industry has fallen a little behind in the aspirin of human relations, though we are probably well ahead on the whiskey of equipment. We must recognize that no man is secondary to the machine that man has invented. Management's greatest problem today is to choose supervisory personnel who will not antagonize the people under them. To change an employee's mental attitude is like bending a piece of wood—it requires a steady pressure exerted over a long period of time.

Professor Wiley, who is with the California State Polytechnic College, San Luis Obispo, evinced much concern over the shortage of young engineers. To meet the requirements of industry, 40,000 to 60,000 freshmen are required each year, but if the present trend continues, the enrollment will fall to about 17,000 in 1954. Concerns that once took only the cream of the student crop are now putting in requests for an engineering school's entire graduating class.

Mr. Vinter, who is with the Danish Central Welding Institution, Copenhagen, told how radiography is being used as an educational tool by the European welding industry. His talk was enlivened by a sense of humor and elicited much favorable comment.

Recrystallization Welding

An extensive and important research on the mechanism of recrystallization welding was presented by John M. Parks. Parks, who was supervisor of welding research for Armour Research Foundation, Chicago, at the time this paper was written, is now with Air Reduction research laboratories at Murray Hill, N. J. The metallurgist, he began his discourse, recognizes only three basic welding processes: fusion welding, brazing (or soldering) and pressure welding. The first two processes achieve an intimate metallic contact by means of molten metal, either with or without a flux. In pressure welding, there is no molten metal and some other mechanism must function in its stead.

After four years of careful study and analysis, the author has proved to himself conclusively that this mechanism is recrystallization and that the so-called pressure welding (or cold welding) process should be rightfully known as recrystallization welding.

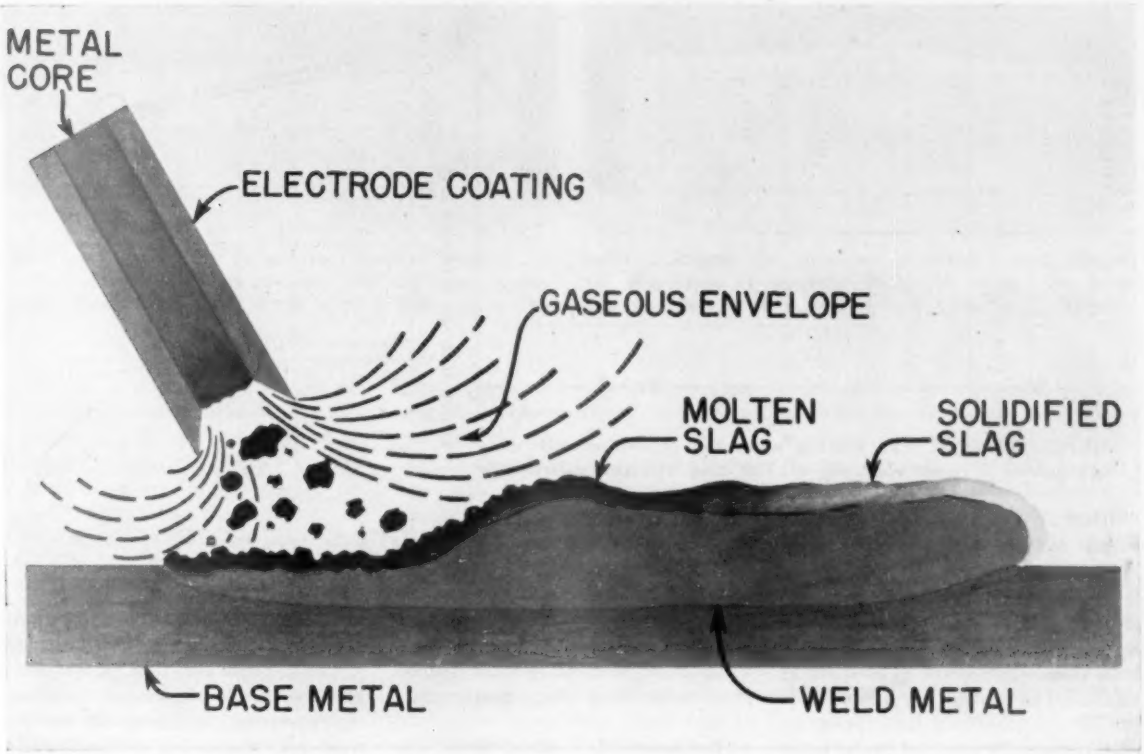
If two metallic surfaces were in perfect atomic registry, and were absolutely flat and free from all types of surface films, they could be welded merely by bringing them together. Under no circumstances, however, can these ideal conditions be met with in practice. When two reasonably clean metal surfaces are pressed together, they are held apart by high points or projections, technically known as asperities. The effect of increased pressure over the faying surfaces is to physically crush the asperities, thus increasing the contact area. Under sufficient pressure, the metal flows. During the process of recrystallization, crystal growth establishes atomic registry across the faying surfaces. This, briefly, is the way in which solid metals are bonded together without the aid of molten metal.

The recrystallization temperature, which varies with different metals and alloys, was found to be extremely important. In general, the greater the degree of deformation (produced by pressure), the lower the recrystallization temperature. A mathematical relationship between recrystallization temperature and degree of deformation was sought for and found; however, the author's formula will not be given here.

Parks presented charts and tables as evidence for his contention that for each metal the discrete temperature of bonding is the recrystallization temperature of severely deformed stock of that metal. This, he maintains, conclusively establishes recrystallization as the mechanism that effects welding.

Metals investigated in this research included electrolytic copper, 70-30 brass, SAE 1020 steel, 2S aluminum, silver-clad aluminum, 75A and 130A titanium, silver and soft lead. The experiments were performed on 1/16-in. sheets, surfaces of which were either diamond-scraped or milled with a steel cutting edge for the dual purpose of removing surface films and deforming the surface layers. Clean, cold-worked surfaces were found to be of the utmost importance for successful recrystallization welds.

(Continued on page 54)



GIVEN a welding arc as shown above, the electrode designer must take stock of all requirements and determine—

What Goes into A Welding Electrode?

Nothing could be simpler to look at than a welding electrode—nor more complex in design and production. An electrode designer must be a metallurgist, a chemist, an electrical engineeer and a production man.

BY D. L. MATHIAS
Research Engineer, Arcrods Corporation

PART ONE

SUPPOSE that you had no coated electrodes and couldn't buy any anywhere. Suppose that you had to develop an electrode from scratch to do a particular job of welding. Do you know what you would put in the coating? Do you even know what you would want that coating to do?

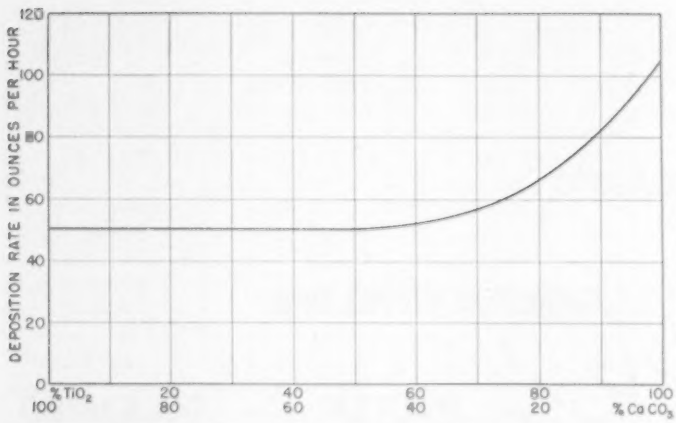
Don't feel too ashamed of yourself if you can't answer these questions. Although tens of thousands of pounds of welding electrodes are consumed every day, very little has ever been published on the subject of electrode design and formulation. In the rather scanty literature that exists, the constituents are usually referred to only by their chemical or mineralogical names, without mention of physical characteristics. Coating materials are invariably referred to as serving but a single function—an arc shielder, an arc stabilizer, a deoxidizer, a slag former, etc. This is oversimplification. As a matter of fact, almost every material is used for more than a single purpose, and some impart characteristics far removed from the function under which they are generally classified.

If we delve into the subject a bit more deeply, we find that an electrode coating is usually a complex combination of materials, selected and proportioned to serve many purposes. Chemical and physical properties of the various ingredients must be carefully considered.

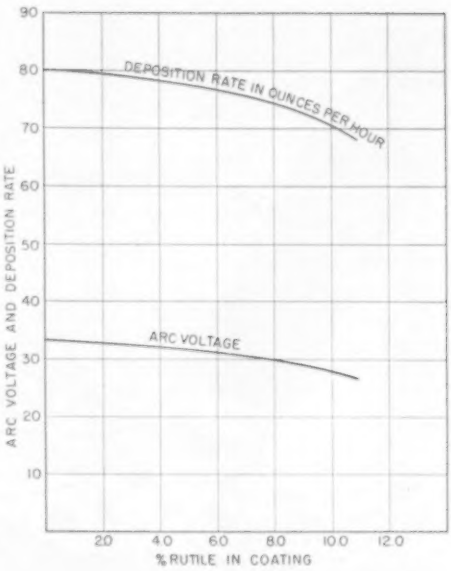
What few references are available on coating compositions deal almost exclusively in terms of percentage content of oxides. Formulation of a coating also involves silicates, carbonates, hydrates, carbohydrates and ferro-alloys, to say nothing of others.

AWS SPECIFICATIONS

Through the joint efforts of the American Welding Society and the



ABOVE: Effect of flux coating upon the deposition rate of a light-coated 3/16-in. electrode at 190 amp straight polarity d-c



RIGHT: Effect of varying fluxing composition upon deposition rate and arc energy of a ¼-in. E-6020 electrode at 325 amp a-c

American Society for Testing Materials, filler-metal specifications have been issued that cover most types of electrodes in service today. The AWS-ASTM specifications have been almost universally accepted by the welding industry as a convenient shorthand for describing the manner in which an electrode operates. Instead of giving a detailed description of electrode characteristics, we merely refer to a basic electrode type such as E-6010, E-6012, etc. The AWS classification number designates minimum tensile requirements, the type of coating, the welding position and the type of power supply—alternating or direct current—to which the electrode is best suited.

As used by industry, a typical electrode specification gives the desired AWS-ASTM classification and supplements this information with a statement of the particular requirement or application for which the electrode is wanted. This form of specification is quite generally employed and serves very well in the absence of the detailed technical description of electrode characteristics.

Coating Types

The three basic types of conventional electrode coatings are cellulosic, rutile (titanium dioxide) and iron oxide. All have survived the test of time. Of electrode types currently in service, however, only the lime-base or low-hydrogen electrode was conceived and developed along strictly scientific lines.

Let us see what it means to formulate a coating upon a scientific basis. First of all, it involves three distinct steps rather than one. These are:

1–Chemical. Coating ingredients are selected on a chemical basis to provide the performance requirements set forth in the specification through reaction, decomposition, dissociation and solution.

2–Physical. Coating ingredients are selected with respect to their physical characteristics to control the rate and/or extent of reaction, decomposition, dissociation and solution.

3–Production. After the physical and chemical properties have been determined in the laboratory, a procedure must be worked out to produce the coatings on a production basis. This importance of the transition from laboratory to production must not be underestimated. It is a vital—and difficult—step.

Chemical Formulation

In the selection of suitable materials to serve the functions for which the coating is to be designed, coating materials are first considered on a chemical basis, paying due regard to composition and purity. An electrode coating serves its intended purpose through rather involved chemical reactions, with the elements and compounds of which the coating is composed existing in solid, liquid and gaseous phases as the electrode is consumed during welding. The progress of these various chemical reactions cannot be followed in detail during welding. Their net effect, however, is reflected in the electrode's operating characteristics, in the nature and action of the slag and in the quality and composition of the weld deposit.

After an approximation of coating composition on a strictly chemical basis, we turn to physical formulation. In this connection we consider such properties as particle size, particle shape, hygroscopicity or ability to absorb moisture, melting point, etc. But first let us see just what an electrode coating must do.

Five Jobs for a Coating

An electrode coating has five main jobs:

(1) To shield the arc stream and the weld deposit against contamination from the surrounding air.

(2) To provide an ionized path to maintain the arc.

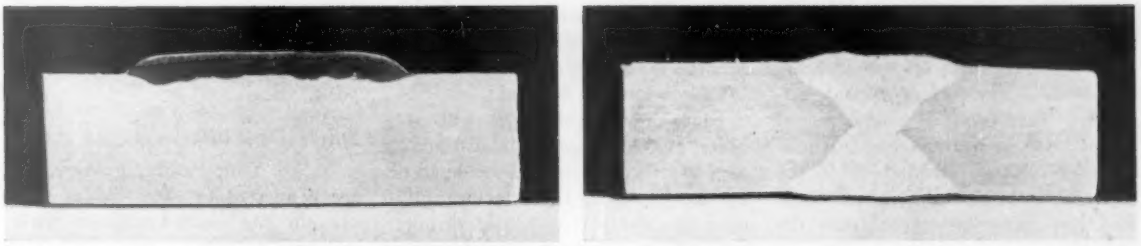
(3) To deoxidize the weld deposit.

(4) To introduce alloying elements that will impart specific chemical and/or mechanical properties to the weld deposit.

(5) To provide slag. Slag serves many functions, as will be described later on.

Job 1–Arc Shielding

Unless the arc is shielded from the atmosphere, most metals will be vigorously attacked by nitrogen and oxygen while they are being transferred across the arc and while they are still in the molten state after deposition.



HOW are energy may be adjusted through coating formulation to meet the requirements of different applications. Both welds were made with 5/32-in. electrodes. Left: A 20-volt arc gives low penetration and dilution for deposition of overlays. Right: A 45-volt arc gives full penetration of a square butt joint in ½-in. plate

Atmospheric nitrogen and oxygen are both detrimental to weld quality, but nitrogen is our primary concern in shielding since it is difficult to control its effect once it has entered the deposit. Oxygen, on the contrary, can be counteracted by the use of suitable deoxidizers.

It is fortunate for weld quality that the detrimental effect of oxygen can be neutralized. Oxygen is not only found in the air; it constitutes an appreciable percentage of the shielding gases that result from the decomposition of both organic and mineral materials. Furthermore, the presence of oxygen in the arc stream is beneficial to arc action through its influence upon the character of metal transfer.

Protection of the arc stream is accomplished through coating materials that decompose, react with other ingredients or vaporize to provide an envelope of gas surrounding the arc. The gases so generated are confined and directed by a crucible or cup that is formed in the flux covering because of its refractory nature. In conventional electrodes, the materials generally employed for shielding purposes are carbohydrates, hydrates and carbonates. Reducible oxides in combination with carbon and some of the relatively volatile materials play a minor role in protection of the arc, although their primary use is for purposes other than shielding. Low-hydrogen electrodes depend entirely upon carbonates for shielding gases. Carbohydrates and hydrates cannot be used because they are hydrogen producers.

The carbohydrates, hydrates and carbonates decompose during welding and liberate shielding gases. Carbohydrates are completely converted to gases without leaving any residue. Hydrates give off water vapor and carbonates carbon dioxide. Both leave oxide residues, which combine with other constituents of the coating and enter the slag.

Upon decomposition, carbohydrates form carbon as an intermediate product, but this is a solid and must be converted to a gaseous compound to avoid defective welds. In most conventional electrode coatings, a residuum of water is retained in the binder solids after drying. This residuum of water (together with such combined water as may be present) accomplishes the transition from solid to gas by first retarding premature decomposition of the carbohydrates and then converting the carbon residue to a gas through the familiar water-gas reaction.

A further and important effect of water is upon the flow of metal during welding and upon the contour of the resultant weld. Hydrogen is formed as a by-product of the water-gas reaction and also through dissociation of water vapor. Considerable thermal energy is required to effect the dissociation of water into oxygen and hydrogen, both of which are released in the monoatomic rather than the molecular state. The atomic hydrogen diffuses to a cooler region just beyond the arc stream and there the atoms combine to form molecular hydrogen. This releases a large amount of energy, which, under the highly reducing influence of hydrogen, "sweats" or wets the surfaces upon which it impinges and thus facilitates the flow of metal through capillary action.

Job 2–An Ionized Path

A stable arc is one that is steady. It is not interrupted by intermittent "pop-outs" or "short-outs" necessitating restriking. To establish and maintain an arc, it is necessary to provide a conductive path for the flow of current. Air is not sufficiently conductive to make it possible to initiate and sustain an arc between the work and low-carbon steel electrodes. Hence we must introduce into the electrode coating materials classed as arc stabilizers. These are selected from materials having relatively low ionization potential and high thermionic emission. They are mostly compounds of the alkaline and alkaline earth metals.

Arc energy is the amount of heat that is released per unit weight of metal deposited; it is expressed as the product of arc voltage and welding current. Arc energy is closely associated with arc stability. Obviously, materials that are capable of altering the conductivity of the arc path must simultaneously influence arc energy.

Factors that affect arc stability and arc energy are:

Nature, amount and distribution of stabilizing materials in coating.

Size distribution of particles in the coating aggregate. The effectiveness of arc stabilizers is improved by using stabilizing materials in a finely divided state.

Type of metal transfer: globular or spray.

Melting point of coating materials.

Fluxing characteristics of coating materials.

Electrical conductivity of coating.

Composition and volume of shielding gases.

Available oxygen.

Distribution and orientation of binder solids.

Water content of coating.

Type and composition of steel in core wire.

Thickness of coating.

Metallic powders in the coating. Such powders as ferro-alloys increase conductivity of the coating and thereby increase the degree of ionization of arc-stabilizing materials.

The effectiveness of stabilizing

agents is destroyed by hydrogen and fluorides in the coating since their ionization potentials are considerably higher than those of stabilizing materials. Arc stability is also impaired by an increase in the amount of gas-forming materials, which dilute the vapors of the stabilizing materials and tend to sweep them from the crucible.

Globular and Spray Transfer

Certain types of electrodes operate with an arc in which the metal transfer is characterized as "globular"; *i.e.*, the drops of metal are large enough to be seen with the naked eye. Other electrode types operate with a spraylike metal transfer, in which the individual drops of metal are too small to be observed. Generally, though not without exception, electrodes designed for all-position welding (usually the cellulose type) operate with globular transfer. Those designed for flat and horizontal positions (iron oxide type) usually have a spray transfer.

Oscillographic studies of electrodes operating with globular transfer show that the arc is momentarily shorted out or extinguished at the instant that molten metal bridges the gap from electrode to work. During this period of metal transfer, arc voltage drops from its normal value to practically zero and welding current rises to a value considerably in excess of normal.

In the case of electrodes with spray transfer, the gap is at no time bridged by the molten metal, and the result is that there are no significant fluctuations in either arc voltage or welding current. When electrodes are designed for direct current, those having spray transfer require less stabilization than those that operate with globular transfer.

Alternating current imposes entirely different requirements in coating formulation. With alternating current, there is a complete reversal of polarity at each half cycle, with both current and voltage passing from peak value on one polarity through zero to peak value on the opposite polarity. Electrodes having spray transfer require a higher degree of stabilization to maintain a steady arc on alternating current than the same electrode requires when used with direct current. The situation is still worse for globular transfer. When the polarity reversals of an a-c circuit are superimposed upon the arc extinctions that characterize globular transfer, the maximum degree of arc stabilization must be effected.

Other factors that influence arc stability are type and composition of steel in the core wire and the depth of the flux crucible. These factors influence arc stability primarily through their effect on the nature of the metal transfer.

The grade of steel known as rimmed steel is used almost exclusively for core wire. Within the carbon range for mild-steel and low-alloy electrodes, metal transfer is quite globular with core wire of 0.05% carbon and progressively changes to spray transfer with increase of carbon to 0.30%. Fully killed steel, which is rarely used for core wire, gives a decidedly globular transfer throughout the above range.

As to the effect of the depth of flux crucible, an increase in the depth of the crucible decreases the frequency of short-outs due to globular transfer and gives an arc that approaches the characteristics of an electrode with spray transfer.

Deposition Rate

Obviously, it is desirable for an electrode to have the highest possible deposition rate that is consistent with welds of acceptable quality. The deposition rate of an electrode is a built-in characteristic and cannot be altered except by changing the welding current. Deposition rate is almost directly proportional to welding current, but it is little affected by changes in arc voltage. A change in the forward rate of advance of the electrode (travel speed) or the use of a different diameter of electrode provides additional latitude of thermal balance, but only to the extent that it is altered by heat dissipation from the region of the weld.

Many applications of arc welding require variations in heat input per unit of deposit considerably greater than can be accomplished by the variables mentioned in the previous paragraph. Such applications range from overlays of hardfacing alloys, stainless steel and anti-friction materials to high-speed welding of abutting parts by fusion rather than by the addition of filler metal. For overlays, a minimum of penetration (consistent with adequate fusion) is necessary to prevent dilution of the overlay. For high-speed fusion welding, a high degree of penetration is required to give the maximum length of weld with the minimum of electrode deposit.

Job 3—Deoxidation

At arc temperature, many metals are converted to their oxides when brought into contact with oxygen or oxygen-containing compounds. Carbon dioxide and water vapor, released from carbonates and hydrated materials respectively, are highly oxidizing at elevated temperatures. Even water, which is released from cellulose subjected to destructive distillation, is capable of exerting an oxidizing effect. The reducible oxides of iron and manganese that are used as slag fluidifiers in some types of coatings provide an additional source of oxygen.

The combined effect of these various oxygen sources could result in a highly oxidizing condition in the region of the arc unless compensated for by suitable additions to the coating. Ferro-alloys such as ferro-manganese and ferro-silicon are added for this purpose.

It should be noted that the influence of oxygen in an electrode coating is not entirely detrimental. While oxygen does reduce the transfer efficiency of certain elements, as we shall see, it also imparts favorable characteristics to the action of the arc. The mechanism by which oxygen improves the arc is not entirely clear, but there is a noticeable shift from globular to spray transfer with increasing oxygen content in the coating. The effect of oxygen is probably twofold: (*a*) it reduces surface tension of the liquid drop on the end of the electrode through exothermic reaction, and (*b*) it reacts with carbon in the core by diffusion to augment the carbon-iron oxide reaction at the liquid-solid interface.

Job 4—Alloying

Besides deoxidizing, the ferro-alloys also add alloying elements to the deposit. Mild-steel electrodes require small amounts of carbon, manganese and silicon in the deposit to give sound welds of the desired strength level. A portion of the carbon and manganese is derived from the core wire, but it is necessary to supplement them by ferro-manganese and, in some cases, ferro-silicon additions in the coating. Other elements such

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Job Was No "Pipe" for Old Kettlehead

Last month we left Old Kettlehead in a sheet metal shop. Now he's a shipyard weldor, but the same Old Ket—weldor of all metals and master of none.

BY CLEMENT HOWARD

PRODUCTION at the shipyard was proceeding at a good fast clip on the day a fellow with a regular foghorn voice walked into the copper shop — Old Kettlehead. Our boy hadn't any more than received his tool checks when the word was passed around that here was a guy "strictly for the birds." It wasn't long before he was notorious because of his overbearing, superior attitude.

Not that Old Ket made enemies; he didn't. He actually made quite a few friends, drinking friends that is! However, he did make a mixed impression on the supervisors. Some said he didn't know a thing; others swore his work was above average. His leadman gave him the benefit of the doubt but always managed to have something else to do whenever Ket started to tell of his exploits.

Kettlehead was a weldor but had been hired in the department as a journeyman coppersmith. He wasn't happy doing coppersmith chores, especially if he had his usual hangover. Most of his assignments were to pound out the wrinkles from pipe. This was a dull chore, and Ket hated it. He was continually reminding anyone who would listen, of his prowess with the torch. Trouble was his leadman and the foreman wouldn't give him a chance to prove it.

Old Ket got more disgusted all the time and he beefed long and loud to get aboard ship. He wanted to do some silverbrazing on the steam, lube oil and salt water systems. He had done some shop work with the torch before, brazing heavy flanges to ¼ in.-wall copper pipe, but here he never got the chance to show his torch ability.

Horn Blew Too Loud

One day the foreman got mad after one of Ket's loud foghorn bleats and transferred him to a leadman with a crew aboard ship. Old Ket was happy until he found out this leadman wasn't going to let him braze up anything either. Then Ket was mad, and his continued complaining in that whiskey-basso voice finally got on the leadman's nerves. "Well, have it your way," he said. "I've got a job for you."

As luck would have it, the leadman had picked a bad day for poor Ket, who was suffering from his usual payday hangover. Here's what the job was:

The coppersmiths had made a steam header for the engine room boiler out of a 4-ft length of 5-in. diameter, 1/16-in. wall copper pipe. To this big pipe, they had attached a half dozen 10-in. lengths of smaller copper pipe, ranging in diameter from ¾ in. to 2 in. This had been done by forming saddle branches on the ends and then fitting them over holes cut in the 5-in. pipe. All joints, including the ends, were brazed up in the shop: then the header was installed aboard ship, and the various saddles were connected to the different lines leading to the lube oil tanks, steam heating systems, galley kettles, evaporator, etc. The hitch was the shop had overlooked one connection: the spud that held the ¼-in. line leading to the pressure gage from the header. Aboard ship, this missing link was a "dog" to braze, and most of the boys knew it. The leadman figured he'd give Old Ket a chance to do his stuff.

Tips and Tips

Ket came down into the engine room, saw that little dinky ¼-in. line and made up his mind that there was nothing to it. He guffawed when the boys asked him what size tip he wanted and then asked for a No. 44 drill size (about 1/16-in. orifice). They had his number right then and there. With poker faces, they gave him the torch and told him to go to it. Old Ket started to work with a great deal of confidence. He knew how to handle a torch all right because he didn't get sooty "clinkers" all over everybody and he had a neutral flame adjustment right off.

After an hour, he had a lot of stuff that looked like melted candle wax

First, he did a good job of applying the flame all over the brazing area. In a few minutes, the flux around the joint started to turn transparent on the spud. Ket was still confident that there was nothing to it. He applied the flame to the 5-in. copper pipe and started to feed a length of 1/16-in. wire to the joint. The wire was a silver-brazing alloy containing 50% silver. Most of the molten metal stuck to the spud but some fell off on Ket's shoes, making him do a tap dance to the great delight of the gang watching. Ket tried more preheat, but no soap. He poured more heat on the header again, but still no soap. By the time he had been pouring heat on the area for about an hour, he had a lot of stuff that looked like melted candle wax and a pretty fair size audience, most of whom were hidden behind the Diesel engines, generators, evaporator, etc. having a hilarious time.

The act got funnier and funnier. Finally, some of the onlookers were rolling on the decking of the engine room in unrestrained hysterics. Only poor, harassed Ket found the situation unfunny. He had started to do the job early in the morning, worked through his lunch hour and now the swing shift was coming aboard. Ket still hadn't been able to make the

(Continued on page 35)

1—EARLY stage in production of aluminum drop tanks for aircraft fuel: assembly of the internal structure

2—INTERNAL parts go on merry-go-round with outer shell sections for degreasing, rinsing and deoxidation

Their Pay Went Up

Same men, using the same facilities, produced more and earned more on a Navy contract for aluminum drop fuel tanks. They didn't work longer hours, either.

BY FRED M. BURT

DRAYER-HANSON, INC., Los Angeles, acquired a contract early in 1951 to manufacture 10,000 aluminum "drop" fuel tanks for Navy airplanes. Tooling was slow and costly, and the daily output was disappointing during the early stages of production. The company was losing money on this contract so the management decided to do something about it.

The president of Drayer-Hanson is George J. Morton. As a member of the western division of the Young Presidents' Organization*, Morton is pledged to promote conditions favorable to individual incentive. It is scarcely surprising, therefore, that he had a plan for increased production worked out in terms of personal incentive. To quote Morton: "The same incentive that stimulates management to increased effort—a promise of greater earnings—is also attractive to the employee."

PRODUCTION SHOT UPWARD

Morton's group bonus plan solved the slow production problem. During the final months of the contract, average daily production was increased to approximately 65 tanks per day. Employees included in the group bonus plan averaged an increase of about 25% in their earnings *without working overtime.*

For six months prior to the group bonus plan, the plant had been producing only 18 to 22 fuel tanks a day. The pick-up to 65 tanks is truly amazing. By June 1, 1952, the plant had crated tank number 10,125 right on schedule and so completed its contract with the U. S. Navy.

The manufacturing operations that were included under the group bonus plan are not all welding jobs. However, welding operations, particularly spot and seam welding, were highly prominent, as is illustrated by the accompanying picture sequence. The first five photos cover the main operations in the continuous production flow.

Photo 1 shows the beginning of the internal structural assembly. Twin brackets are attached to a common beam and then riveted to a saddle. This assembly will subsequently be spot welded into the upper section of the shell.

Photo 2: In preparation for welding, all internal parts of the tank are placed in a basket between the outer shell sections. These sections are then hung on a merry-go-round fixture. Movement is as follows: load, degrease tank, rinse, etch tank, rinse and unload. A hydraulic ram in the center of the merry-go-round raises and lowers the radially located tanks.

Photo 3: Bulkheads are spot welded to the tank's lower shell by means of three 100-kva machines.

Photo 4: Now upper and lower tank sections are seam welded together on a 150-kva machine. Each tank requires 23 ft of seam. Production at the start was only 10 tanks per day but this was increased to a maximum of 86 tanks a day when the incentive plan got into full effect. The same seam welder—and only the one machine—was used throughout the duration of the contract.

Photo 5: After seam welding, the tanks pass through a 10-psi air pressure test. Soap solution is painted on the weld seam to show up leakers. Leaks are marked with a red pencil for rewelding. The tanks then move along the conveyor line for a dip in a 5% chromic acid solution, followed by a hot water rinse.

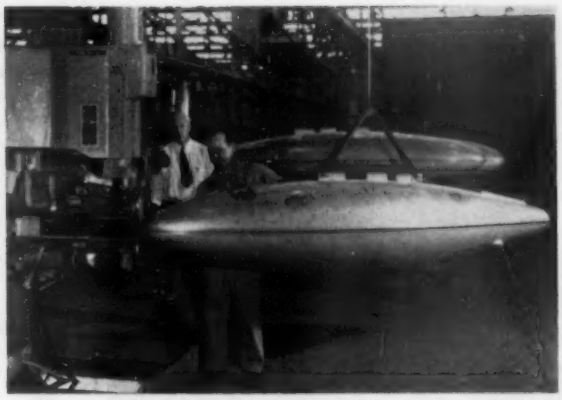
HOW PLAN WORKED

This incentive plan can be used as a pattern, adaptable to many continuous quantity productions in which welding is a major factor. The group plan embraced:

1. Time studies: A scientific analy-

*To qualify for membership in the YPO (Young Presidents' Organization), a candidate must be under 39 years old and be president of an industrial corporation with annual sales of at least $1,000,000 and a minimum of 100 employees. If he heads a service organization, a business of at least $2,000,000 annually is a must requirement.

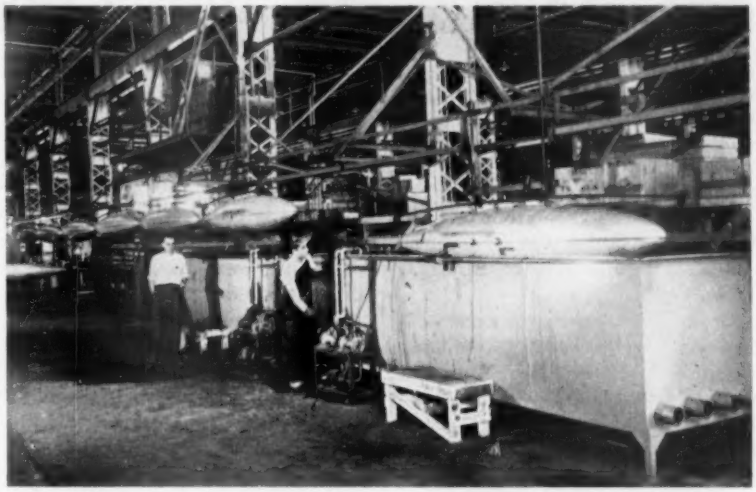
3—SPOT WELDING is done on three 100-kva welders. Here bulkhead is being spot welded to the lower shell



4—UPPER and lower shell sections are seam welded together on a 150-kva welder, 23 ft of seam to a tank

25%...

and More



5—WELDED fuel tanks are pressure tested at 10 psi. If okay, they are moved along this conveyor line for a chromic acid dip and hot water rinse

sis of the methods and equipment used or planned in doing a piece of work, development in practical detail of the best manner of doing it and determination of the time required.

2. *Basic times:* Observed times from the time study before allowances were added.

3. *Allowances:* Extra time added to compensate for various items that require the operator's time but are not a regular part of any one job. Included under this head are:

(*a*) Personal allowances. Time necessary for a worker's personal necessities, 3 to 5%.

(*b*) Fatigue allowances. Time allowed every worker to compensate for a reduction in efficiency because of fatigue, 1 to 3%.

(*c*) Delay allowances. Time allowed every worker for incidental interruptions and minor delays arising from tool breakage, machine stoppage, variations in material and supervisory contacts, 4 to 7%.

4. *Allowed time:* Time allowed every worker for every necessary operation performed in turning out a complete job. The allowed time is equal to the base time plus all allowances.

5. *Productive time:* The amount of time contributed by an employee directly towards the production of a unit.

6. *Non-productive time:* The amount of time utilized by an employee on supplementary work; *i.e.*, work not directly affiliated with the production of a unit.

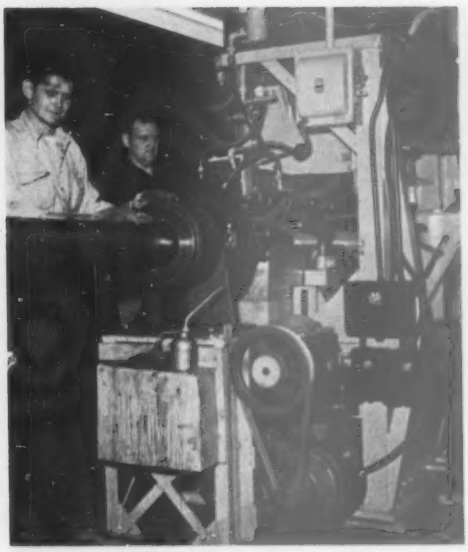
7. *Bonus:* Percentage of time saved due to the difference between allowed and productive times.

Base and Allowed Time

Time-study data were compiled for all operations necessary to manufacture the specified unit. The work cycle for each manufacturing operation was divided into elements, and times were recorded for the various elements until at least eight cycles were completed. The overall time was then divided by the number of work cycles. This gave the base time for the operation.

The allowed time was obtained by adding to the base time all allowances established for fatigue, personal needs and delay. The allowed time for a complete unit was determined by multiplying the allowed time per operation by the number of men required and by the number of operations per unit. The time thus calculated was expressed either as man-minutes or man-hours per unit.

The total time allowed for one week was determined by multiplying the allowed time per unit by the number of units completed. Productive time for the corresponding week was obtained by totaling the number of productive hours recorded on the labor cards. The bonus as already defined, was the percentage of time saved due to the difference between allowed and productive times. All bonuses were computed on weekly production and appeared on the individual's pay check corresponding to that work week.



6—UNIQUE machine for finning steel tubes. At the right is Arthur Powell, in charge of this operation; on left, operator Roy Reese. Reese is cleaning a 5/16-in.-diameter tube as it moves through the driving head

7—COPPER tubes are finned on a different machine by soldering (see text)

On this fuel tank contract, the operations were grouped according to shop proximities and other controlling factors. This resulted in four groups:

Group 1—"Saddle" group. Assembly of inner section (which must be compared to the yolk of an egg). 13 workers.

Group 2—Assembly of inner section with the two halves of the tank. 35 workers. All of the welding was done by Group 2.

Group 3—Miscellaneous service operations: drilling, burring, reaming and certain minor assemblies. 3 workers.

Group 4—Painting, crating, billing and shipping. 12 workers.

The workers given above are the average number working in each group after the incentive plan had been well established.

How to Find Quota

For the welding by Group 2, the general operational breakdown was:

Etch.
Spot weld, 5 operations.
Inert-gas weld tube fittings.
Sealer compound application.
Spot tack welds.
Seam weld.
Strap retainers.
Pressure test.

Total allowed time for these operations was 331.8 minutes or 5.53 man-hours. Now let us see how the bonus is calculated on this allowed time per assembly of 5.53 man-hours.

If 30 men work 8 hours each, their total is 240 man-hours a day. They must produce 240 ÷ 5.53 = 43.4 assemblies before a bonus is earned. Suppose they produce 54.3 assemblies in the same number of man-hours. The difference between 54.3 and 43.4 is 10.9. Divide this by the quota of 43.4, and you will find they would have earned a bonus credit of 25% for the day.

The average weekly bonus earnings of the combined four groups ranged from a low of 13% at the start to a high of 32% the next to the last week of the contract. That's not hay! And bear in mind again that no overtime is involved.

The bonus percentage, of course, applied only to productive hours. An employee who could not contribute directly to the productive unit, for any reason whatever, asked permission of his immediate supervisor to punch off the production job and be assigned to supplementary work paid for at regular straight time.

With this incentive plan, the increased pay comes solely from accelerated production through improvements in individual and group efficiencies. The company profits through a decreased ratio of factory overhead to volume of production and by augmenting manufacturing capacity without additional facilities.

Among specific effects, clean-up time was cut down because care was taken that less clean-up was necessary; tools and materials were handled more efficiently. The time-studies, taken by one man over a two-month period and then checked with union representatives, pin-pointed operational inefficiencies.

Civilian Production

This company attempts to maintain an even balance between defense business and civilian production. The civilian production is highly diversified. In general, commercial air conditioning and refrigeration units are manufactured plus many types of industrial products (largely for the oil industry), including aerial coolers, compressed air drying units, waste heat boilers, shell and tube exchangers, evaporative coolers, atmospheric tubular sections and heat recovery silencers.

Practically everything manufactured is built to specifications to suit the exact requirements of the customer. This makes the production problems essentially those of a big job shop. It would seem that the overall application of a group bonus incentive plan would be almost impossible to devise and operate successfully. Such a plan, however, is slowly being adopted in a satisfactory manner.

After three months of planning, preparation and time-study, the incentive plan was put into effect for the air conditioning and refrigeration divisions. The coil and condenser departments were the first to operate under this plan with the metal department following two weeks later. The plan is subject to a three-month trial period, during which the time-study data and operational methods are reviewed and revised. At first, the percentage of coverage was dis-

couragingly low, but it soon started rising.

During the first week of operation under the incentive plan, the performance of the coil and condenser departments was 85% of standard. During the tenth week, performance in the coil department was up to 126% and in the condenser department up to 131%, with incentive coverage on about 35% of all jobs. The best results, in terms of employee earnings, will be obtained when the coverage reaches 70% to 80%, with a potential of close to 25% extra bonus pay.

Welding in the coil department, composed of 10 men, is mostly oxyacetylene welding and brazing of piping. In the condenser department, the welding is mostly structural arc welding on angle iron frames and small pan corners, with some torch cutting.

Tube Finning Machines

Through the acquisition of the Jackson Engineering Co., Drayer-Hanson has added a new Industrial Division for the manufacture of heavy heat exchange equipment, primarily for the oil and gas industry. For use in the Industrial Division, the company has purchased an unusual machine, said to be the only equipment of its kind. Its special function is to attach either steel or stainless-steel fins on steel tubes of diameters from 1 to 7 in. and with lengths up to 65 ft. Such finned tubes are used for heating and cooling oils, condenser tubes and furnace tubes.

The finning machine was set up in the plant by Arthur Powell, who now heads the D-H tube finning department. In photo 6, Powell (at right) is checking a 5 9/16-in. tube that is moving through the driving head. Besides turning the tube, the head carries three wheels with serrated edges for forward thrust of the tube at a predetermined speed. The coil of steel strip from which the fins are made is fed to serrators and then to a die that forms a shoulder at right angles to the fin serrations. A rolling weld attaches the shoulder of the fin to the tube.

On the particular job pictured in photo 6, the fin wrapping and welding for one foot of tube length required 60 turns, and a foot of tube was finned in 2 minutes and 20 seconds. On an average, 4 to 6 fins are welded per surface inch of tube. The fin strip ranges from ½ to 2 in. wide and from 0.012 to 0.062 in. thick.

The equipment for this special type of seam welder includes a 150-kva welding transformer and 12-in. copper welding and ground wheels. An electronic tube converter changes a-c to d-c to operate d-c motors on the feed. Other electronic equipment includes controls for current and weld cycles to conform to variations in shoulder thickness.

The company has also purchased a copper-fin to tube welding machine (photo 7). This job is done in an entirely different way. The serrated strip with shoulder is wrapped around the tube over solder that the operator applies on the tube with a soldering stick and melts with an oxyacetylene torch.

NO "PIPE" FOR OLD KET

(Continued from page 31)

silver alloy stick to the header. He had just about burned up the spud; the header was badly oxidized, and Ket himself was nearly blind from the whiskey-laden sweat that had been running into his eyes. The swing shift thought it was a swell show. By three o'clock the forward engine room was beginning to look like Grand Central Station at the beginning of a three-day holiday.

Ah Heat! It Does Things!

One of the boys to whom Old Ket had been blowing off steam about his prowess as a weldor happened to come into the engine room about that time. He took one look at poor Ket and figured things had gone far enough. He took the torch away without saying a word, removed the tip with the 1/16-in. orifice and installed a tip *double* its size. When he relit the torch, it had a flame 18-in. long that looked like a blast furnace. This Good Samaritan then started in to heat the copper header. After a minute or so, he reached into his back pocket and pulled out a length of phosphor-copper—15% silver rod containing a self-fluxing agent. Then he brazed the joint in less than thirty seconds.

Kettlehead blinked his eyes and stood there with his mouth gaping. Finally, he started to mutter, "I'll be an S.O.B.! I'll be an S.O.B.!" He walked up the engine room ladder, down the gang plank and out the front gate so chagrined that he never did come back for his pay check.

No one ever told poor Ket what the trouble was. He's probably wondering to this day. He had brazed lots of 5-in. copper pipe of 1/16-in. thickness in his time, and with a 44 drill size tip too, and nothing like that had ever happened. But this header was installed aboard ship and that made all the difference in the world.

When Ket applied his torch to the header, the heat from it drove out the air and created a regular vacuum. This pulled air up through the lines from down in the lube oil tanks, which were next to the "skin" of the ship below the water line, with the sea water near freezing. It was that cold, cold air that Ket was heating. It poured through those lines so fast, you'd have thought the boiler was going full blast. When the larger-size tip was used, however, the amount of heat around the joint was so great that the cold air didn't get the chance to chill the heated metal.

Alas, poor Kettlehead!

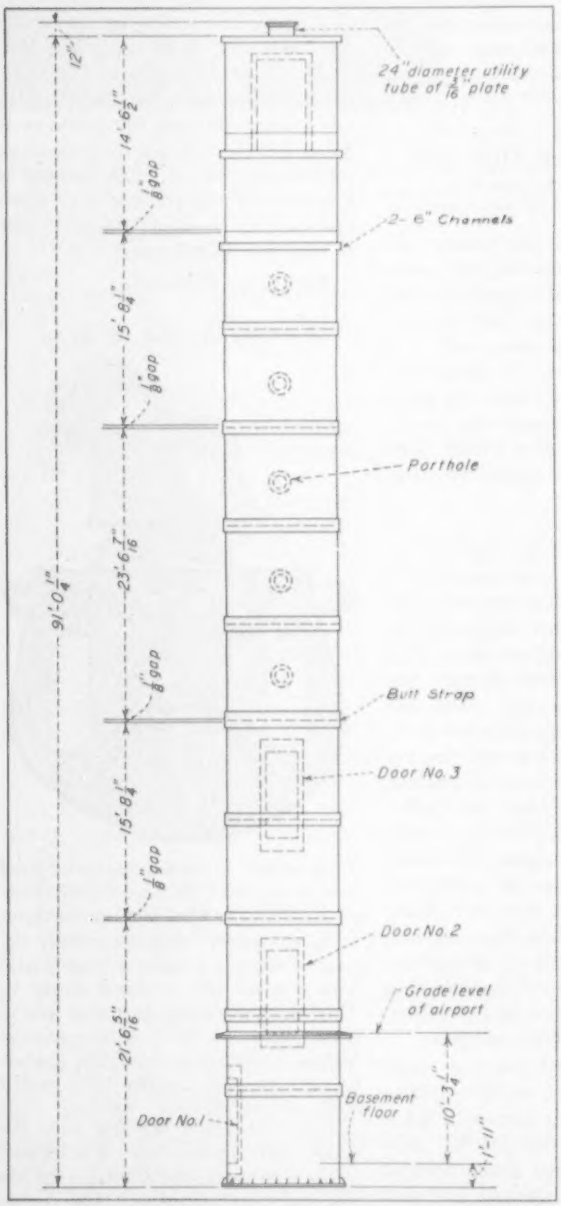
Kettlehead Coat of Arms

This shield is similar to the original coat of arms of the first Sir Godfrey of Kettlehead, who was an armorer of King Arthur's day. Originally the coat of arms was only a large kettle with a small one inverted above it. This symbolized the fact that everything made by Sir Godfrey always leaked. Generations later the torches crossed and the goggles were added with cylinders and welding rods rampant. However, we still have the leaky kettle. Our boy, Kettlehead, nobly carries on the tradition of his ancestor Sir Godfrey. He never learned either.

Sky Tower for Sky Harbor

Unique control tower at Phoenix airport is of welded steel construction, and a better use could not be made of welding.

BY T. B. JEFFERSON



STANDPIPE for water? No, a container for spiral stairs

MOST outstanding feature of the Sky Harbor municipal airport at Phoenix, Ariz., is the control tower on the terminal building. As your plane taxis toward the building, you realize that the tower is unique in appearance. Not until you have deplaned, and are walking by the structure, however, do you realize why: this tower has the appearance of a standpipe and would pass as one except for the crown of glass and steel on top.

The tower is 92 ft above ground or 102½ ft above its base, which rests two feet below the basement floor of the terminal building. The two-story control room is 81 ft above ground. The tower shell is 9 ft in diameter and is made up of 12 cylindrical courses or tiers. The seven lower courses are of ⅜-in. plate; the upper five courses of 5/16-in. plate.

Running vertically through the center of the structure is a 2-ft utility tube fabricated of 3/16-in. plate. This tube serves a dual purpose: (1) as a column to provide an internal anchor for the spiral stairs leading to the control room and (2) as a duct through which pass radio, telephone, teletype and electrical conduits as well as the housing for heating piping.

Shop Fabrication

The tower shell was built in a manner quite similar to methods employed for the building of cylindrical steel tanks. The plate was fabricated in Phoenix by the Consolidated Western Steel Corp. After the plates required for the various courses had been flame-cut to size and rolled to shape, they were welded into sections and shipped to the job site for field erection.

Automatic submerged-arc butt welds were made to join each course into a ring. The problems were no different than those normally encountered in tank fabrication. The various courses were positioned on turning rolls and automatically welded into 9-ft cylinders of varying lengths.

In all, the tower was fabricated in five sections. Two of these sections, the first and the third, were three courses and varied in height from 21 ft 6 in. to 23 ft 6 in. Three sections were only two courses high and varied from 14 ft 6 in. to 15 ft 8 in. All of the circumferential welds were made automatically, and all were of the square-edge butt type. The plates were spaced with a gap of ⅛ in. between them.

Each joint was reinforced with a butt strap, generally 12 in. wide and of the same thickness as the plate; *i.e.*, the joint between ⅜-in. plates was reinforced with a ⅜-in. butt strap, between 5/16-in. plates with a 5/16-in. butt strap. These butt straps were made in two pieces. The two halves were welded with a circumferential fillet of the same size as the thickness of the strap, and the ends were then butt welded together, using a 60-deg vee-groove with a spacing of ⅛-in. at the root. The procedure was similar, whether the strap was welded in place in the shop or in the field. The difference was that automatic submerged-arc welding was used in the shop; manual welding in the field.

Field Erection

Field erection started with the placement of a ring of 1¼-in.-thick steel on a footing two feet below the basement floor level. This ring has an outside diameter of 9 ft 9⅛ in. It is held in place by 72 anchor bolts of 1⅛-in. diameter.

When the base ring had been firmly bolted in place,

the first section, 21 ft 6 in. high, was set on the ring and manually welded to it, using a ⅜-in. fillet weld inside and out. Then gussets were welded to the ring and the shell at 36 locations. These gusset plates were flame-cut to a size of 4½ by 6 in. and were welded by ⅜-in. fillet welds all around. They were attached back to back, both inside and outside the shell.

The four upper sections were welded one on top of another. All of the butt joints for these field welds had a 60-deg vee-groove with ⅛-in. root spacing. The welds were manual and were made from the inside. These circumferential joints, with the single exception of the joint between the two upper sections, were reinforced with butt straps in a manner similar to that discussed in connection with the shop welding.

The butt strap was omitted between sections four and five because it would have interfered with the mounting of the control house. However, this area of the shell was reinforced by six large gussets, which also serve as brackets to support the control room. These gussets, which look like curved fins or propellor blades, help to give the tower its unique "modernistic" appearance.

In the circle at which the gussets were attached to the shell, there was a double ring of 6-in. channels, welded both inside and outside the shell. These two channels, in effect, form a curved box section with the shell plate at the center. Similar rings of 6-in. channels were also welded around the top of the shell, again both inside and outside. These rings added materially to the stiffness of the upper part of the tower shell. They also provide bearing surface for the structural members of the control tower cab and subcab assemblies.

The tower shell was fitted with four doorways. The three lower openings provided entrances at the basement, ground floor and second floor levels. The fourth doorway was at the 92-ft level for entrance to the lower level of the control room. All doorways had a built-up sill and jamb, which were fabricated from ⅜-in. plate. A 1-in. plate was used to reinforce the sill.

Cab and Subcab

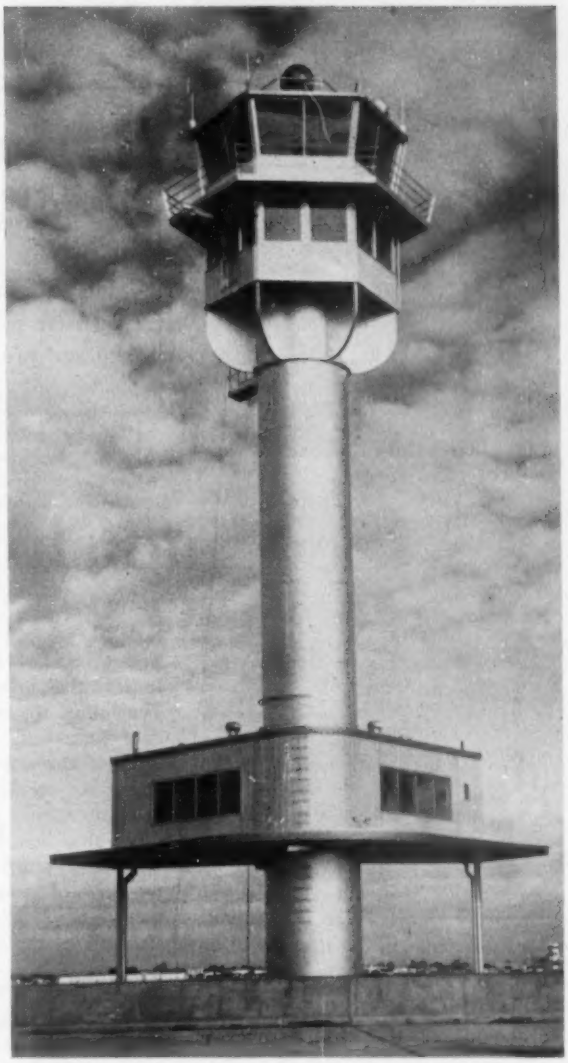
The control room is surprisingly large, having a floor area of over 300 sq ft. It is technically named the cab and the assembly immediately below it the subcab. These two assemblies together make a hexagonal structure having an internal diameter of 16 ft. A walkway around the circumference brings the overall diameter to 22 ft 8 in.

Cab and subcab were formed of plates and structural shapes (primarily channels) and were entirely field welded. Despite the many heavy structural shapes employed, tack welding played an important part in the fabrication. Erection bolts had to be used only on the roof section, where the structural shapes had to be erected in short lengths. For the roof decking, 3/16-in. steel plates were used. Extensive use was made of plug welding for fastening the floor plates to various structural members.

Most of the field welding in the tower control room area was of the fillet type, 3/16 and ¼ in., the size of the fillet depending upon the thickness of the material being joined.

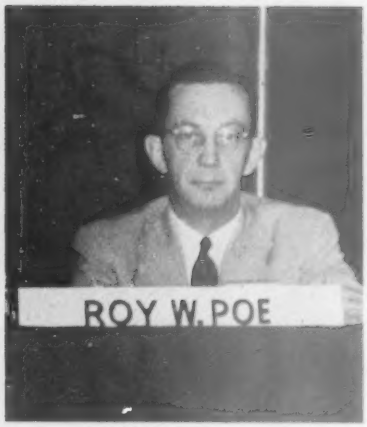
From the materials standpoint, less than 40 tons of steel shapes and plates were required. Combined with 3,500 ft of weld beads, these 40 tons of steel have provided Phoenix with the most unique airport control tower in the United States. It is also a very sightly structure.

(see also front cover)



TOWER after completion of erection but before the terminal building was built (see the picture below)

TERMINAL building and tower looking from street side



Paste This in Your Salesbook!

To SELL MORE: Sell in such a manner that your prospects can SEE the products; so that they can SEE the things you tell them about what the products will do; so that they can SEE the advantages you talk about; so that they can SEE proof of the claims you have made. If you sell this way, you will SEE sales grow and SEE profits increase.

See-manship in Selling*

BY ROY W. POE
Sales Manager, Tweco Products Co.

MANY a man has said, by way of apology, "I can recall your face, I can't remember your name." Did you ever stop to think why that should be? The reason is basic: we *see* a man's face, but we only *hear* the man's name. There is a tremendous difference in the strength of the impressions we receive between the eyes and the ears.

600,000,000 EYE IMPRESSIONS

A friend of mine is an eye specialist. He is quite a noted doctor, who has performed some almost miraculous operations. He told me some things that amaze me. For example: there are 100,000,000 tiny fibrous nerves that lead from the eyes to that section of the brain which receives the images we see. Each of these hundred million nerves is capable of sending six impressions at one time to the brain. That means a total of 600,000,000 impressions, all making up a part of the picture we are seeing. Is it any wonder that we can see so many things? Why we can take in the minutest details at a single glance?

In comparison, the ears are feeble in transmitting messages to the brain.

Another thing my doctor friend told me is that we are prone to believe the things our eyes show us. The things we hear, we accept on faith in the person we are talking to. The things we see, we accept on our own judgment. That difference extends to the printed and the spoken word. We are much more apt to believe something we read than something that somebody tells us.

If you want to increase the effectiveness of your sales calls, tie them into visual impressions and the strength of the printed word.

WHY BUSINESSES FAIL

A recent report, put out by Dun & Bradstreet, gives the reasons for business failures in 1951 among wholesalers. Over 25 different reasons were listed, but there were four major causes for the failures. These were as follows:

- 47.4% failed for inadequate sales
- 18.1% failed for receivables difficulties
- 13.8% failed for inventory difficulties
- 13.8% failed for competitive weakness

If you total up the first and last figures, you will find that 61.2% of the failures can be attributed directly to lack of sales ability. Adding the receivables difficulties, which are the direct responsibility of the sales department, 79.3% of all failures are because of the sales department.

If lack of sales is such a contributing factor to failure, then there shouldn't be any doubt in anyone's mind about the importance of the sales department, nor about the importance of carrying on a continuous, aggressive sales promotion campaign at all times. And yet, in traveling the country from one end to the other, I see the bulk of the welding distributors spending ten times more effort on the details of running the business than they spend on sales. They spend thousands and thousands of dollars on trucks and other equipment to deliver the merchandise after it is sold and yet hesitate to spend ten dollars to increase the effectiveness of the men who are responsible for getting the sales.

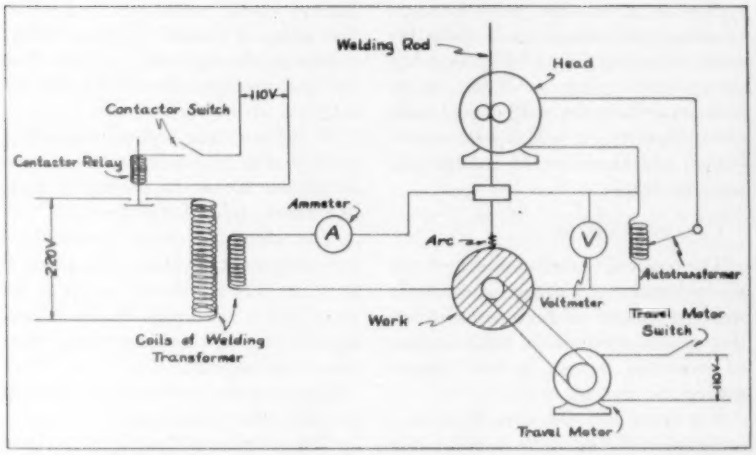
GET STARTED TODAY

The way to start on the road to better merchandising and better personal selling is to do the things you already know you should be doing but have never found quite the time to do. As a second step, gather new ideas from your associates, from books, publications, observation of other types of businesses and put them into operation in your own business.

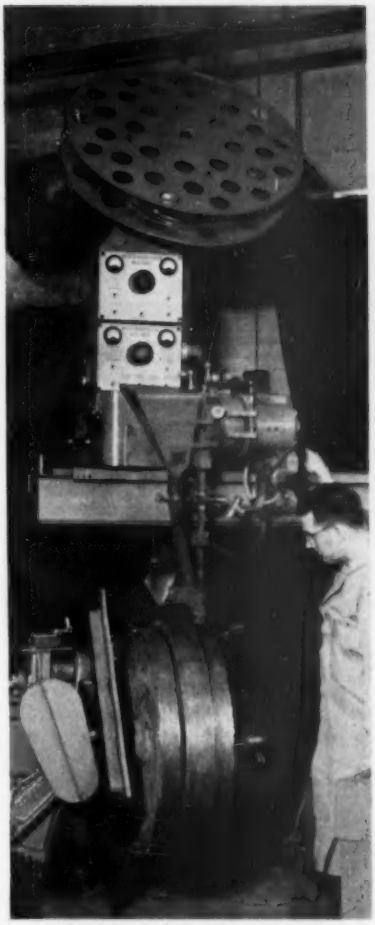
All welding distributors, presumably, know *how* to use promotional

(Continued on page 45)

*Abstract of a talk before the annual convention of the National Welding Supply Association, Cincinnati, May 12, 1953.



7—SCHEMATIC diagram of automatic welder circuit used for rebuilding operations. The autotransformer, ammeter, voltmeter, contact switch and travel switch are all located in the control panel. Control of arc length is accomplished entirely by the welding head. The autotransformer sets the voltage range but has no direct effect on the control of arc length



SET-UP is for rebuilding of tractor idler wheels by automatic welding

Arc Length—Current—Voltage

Key to an understanding of automatic welding is in the relationship between the above three variables. This installment tells you how to maintain a steady arc and how to get smooth welds on cylindrical workpieces.

BY BRUCE L. BAIRD
Welding Products Division, American Manganese Steel Division of American Brake Shoe Company

PART TWO

This "back to fundamentals" article is easy to read and tells you what you need to know about automatic welding. In case you missed the first installment (THE WELDING ENGINEER, July, 1953), *Author Baird went back to the five simple electrical devices that make up an automatic welder: the relay, the transformer, the autotransformer or voltage divider, the electric motor and the generator. He described each of these in turn, with sketches to show the operating principle. Then he put the parts together to get an automatic welder. He explained why arc length always corresponds to voltage drop and why the shortening of an arc also results in an increase in welding current. From this, he explained the operation of rod feed: how you can maintain a constant arc length if you vary the rod feed and how you can allow the arc voltage itself to drive the welding head. Now take up the story from here.*

WHEN an arc is unstable, it will frequently be snuffed out and the electrodes often "frozen" to the work. Arc instability is therefore a major problem of automatic welding.

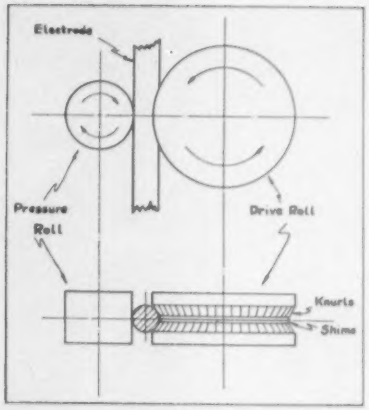
An automatic welder relies on an increase or decrease in rotational speed of the welding head to maintain a stable arc. Hence it is influenced by the inertia effects that are caused by speeding up and slowing down the moving parts of the motor. When compensating for changes in arc length, the electrical circuits must overcome these inertia effects.

With an a-c welder, for a given rod of a given diameter, arc instability can occur because: (1) the transformer open-circuit voltage is too low, (2) the power line feeding the transformer is too weak, or (3) an excessively low current setting is being used.

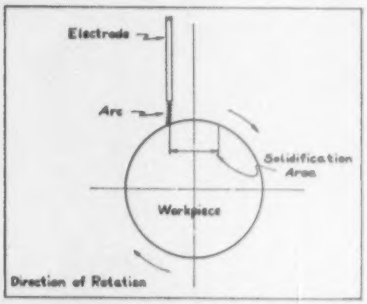
With a d-c welder, for a given rod and diameter, the low current setting is usually the only cause of arc instability that need be considered.

TRANSFORMER VOLTAGE

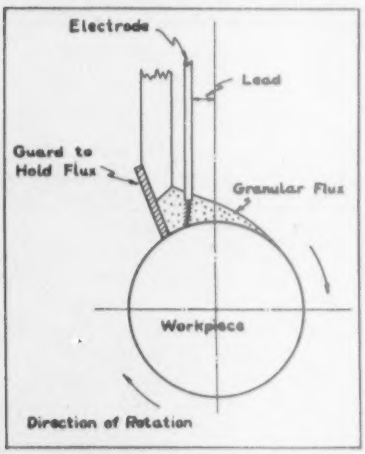
The open-circuit voltage of a transformer is the voltage that is read on the voltmeter across the arc before commencing to weld. It is a characteristic inherent to the particular transformer. A typical transformer for automatic welding is designed to



8—ROD FEED: the pressure roll forces the wire against drive roll



9—MOLTEN metal must solidify before it can be pulled by gravity



10—ELECTRODE "lead" is important to weld metal solidification

show an open-circuit voltage of 80 volts when the primary coil is connected to either a 220- or a 440-volt line. As a general rule for an a-c automatic welder, for a given rod and diameter, the higher the transformer open-circuit voltage, the greater the arc stability.

A weak power line (weak in terms of kva, not voltage) will have the same effect on arc stability as a low open-circuit voltage. (If the transformer feeding the shop hasn't sufficient capacity, it will become overloaded and therefore its voltage output will drop.)

Current Setting

The position of the transformer current selector is a measure of available welding power. A high current setting means a relatively large amount of available power; a low current setting the reverse.

For every rod diameter, there is a minimum welding current. Below this minimum, the inertia effects will cause the arc to become unstable. As an example, with a 5/32-in. rod, the minimum alternating current is often in the range from 300 to 325 amp; with 3/16-in. rod, it is in the range from 325 to 375 amp. In general, the larger the rod diameter, the higher the minimum current required.

What to Do When—

When a transformer of low open-circuit voltage combines with a low current setting, the welding power is often insufficient for a stable arc. To be specific, a transformer with an open-circuit voltage of 65 volts may not sustain a stable arc at 300 amp when welding with a 5/32-in. rod.

Usually you can correct arc instability by increasing welding current. Sometimes, however, this is no true solution because your work may be thin-gage material and unable to take any more heat. In this event, check the main power supply line to see if you are losing power. This can be done by taking a voltage reading across the primary terminals of the welding transformer before and after commencing to weld. If the voltage decreases more than 10% after commencing to weld, arc instability may be encountered. If the line is okay, then you might try substituting a transformer of higher open-circuit voltage. If this is not available, your only remedy is to substitute a rod of smaller diameter for the one you are using.

Methods of Arc Shielding

Automatic welding can be classified by the arc shielding method used. These are: (1) open arc, (2) inert-gas shielded and (3) submerged arc.

The open-arc method employs a bare or coated electrode. Its application today is limited to types of electrodes producing weld deposits that are not greatly affected by the absorption of atmospheric gases.

In the inert-gas method, the molten weld pool is shielded by a gas, such as helium or argon, to prevent it from absorbing atmospheric gases.

The third automatic method is submerged-arc welding, in which a granular flux is poured on top of the arc. This is probably the most popular of the automatic welding processes used today.

Let us have a closer look at that granular flux compound.

The function of the flux is to shield the arc. Most submerged-arc fluxes are a mixture of various silicates. The most popular ones contain a percentage of manganese. A portion of the manganese is deposited in the weld, while a portion of the alloys in the electrode is picked up by the solidified flux. In spite of this adulteration, the solidified flux can be reground and used over again. However, difficulty will be encountered when rods of different alloys are used with the same reground flux. As an example, a rod high in chromium will leave chromium in the flux. If now the flux is reground and used with a low-chromium rod, in an application where chromium will affect the weld deposit, a poor deposit is apt to result.

Because of the welding heat, a portion of the flux is melted and solidified over the weld deposit. The solidified flux must be removed before a second pass can be made.

The granular flux will conduct current only when molten. With some automatic heads before you can strike an arc, you have to place a small ball of steel wool between the end of the electrode and the workpiece. The steel wool is burned the instant welding voltage is made available at the electrode, and the resulting heat melts a small volume of flux around the electrode. This enables the welding current to be conducted, and the heat of the arc then continues the melting process without further attention.

Many automatic welders are equipped with automatic starters and do not require a ball of steel wool for striking the arc.

A schematic of an automatic welder circuit appears in Fig. 7. The autotransformer, ammeter, voltmeter, contact switch and travel switch are all located in the control panel. Control

of arc length is accomplished entirely by the welding head. The autotransformer sets the voltage range but has no direct effect on the control of arc length.

This particular welder (Fig. 7) is one used for rebuilding operations on work that may be rotated beneath the arc. The special problems that are encountered with cylindrical workpieces will be discussed later on.

Rod Feed

All automatic welders feed the rod to the weld by means of some type of drive roll, which is attached to the output shaft of the head. Usually, an adjustable, spring-loaded pressure roll is also used. It is the purpose of the pressure roll to force the electrode against the drive roll, as shown in Fig. 8. Most drive rolls are machined with a knurled V-groove, into which the rod is forced by the pressure roll.

Excessive pressure against the drive roll will crush any tube-filled electrode. Furthermore, excessive pressure wears the knurls from the V-groove and actually handicaps the control of the head by forcing it to do the work of making deep knurl impressions in the electrode. For this reason, light roll pressure is recommended.

Under ordinary conditions, only a minor amount of drive roll pressure is required to feed the rod without slippage. When excessive pressure is required, it is either because the knurls on the drive rolls are worn (this will happen only if excessive pressure has been used previously) or because the rod is not being held deeply enough in the V-groove for the knurls to take effect.

The drive roll sketched in Fig. 8 is split, and the two halves are separated by shims. With this type of drive roll, the addition of a shim will often correct for slippage by allowing the rod to seat deeper in the V-groove.

Some manufacturers of automatic welding heads provide a separate drive roll for each size of electrode. The knurled grooves of each roll are machined to fit its particular electrode size.

Cylindrical Workpieces

Automatic welding is frequently used for the rebuilding and hardfacing of cylindrical objects such as tractor rolls and idlers. This introduces a special problem. When you want to achieve a smooth weld on the surface of a cylinder, the molten metal must solidify before gravity is able to affect it. This means that it must solidify on the top side of the workpiece within a cylindrical area of the approximate size indicated by Fig. 9. If the weld does not solidify within this area, the molten metal will tend to run as the workpiece is rotated. Then ridges and lumps will appear on the built-up surface. The weld metal must be carried to the top side of the work cylinder while still molten and must solidify before it reaches the extreme downhill side.

Four factors determine the solidification of the weld within the proper area. These are: (1) the speed of rotation of the workpiece, (2) the amount of welding current, (3) the position of the electrode with respect to the center of rotation of the workpiece, and (4) the heat build-up in the workpiece. Of these, (3) the position of the electrode is the most important. It must be forward (in a counterrotational direction) of the vertical from the center of rotation (Fig. 10).

Electrode "Lead"

The position of the electrode forward of the center of rotation is generally known as the lead (Fig. 10). For most cylindrical work, the lead is set from 1 to 2 in. forward of center. If the lead is set correctly, a bead with a flat, smooth back will be deposited on the surface of the workpiece, and successive beads will overlap smoothly. If the lead is too small, the back of the bead will begin to arch.

The arching of the back of the bead is the first sign of insufficient lead. The second sign is the appearance of a small ridge between each bead as the beads overlap. The third sign is the appearance of lumps and runs on the welded surface.

If the lead is too great, the bead will often weave slightly rather than lay on the surface in a straight stringer. Also, molten flux will tend to pour down the forward side of the workpiece.

By watching the bead contour, the operator can correct the lead as the weld progresses and thus achieve a rebuilt surface of good appearance.

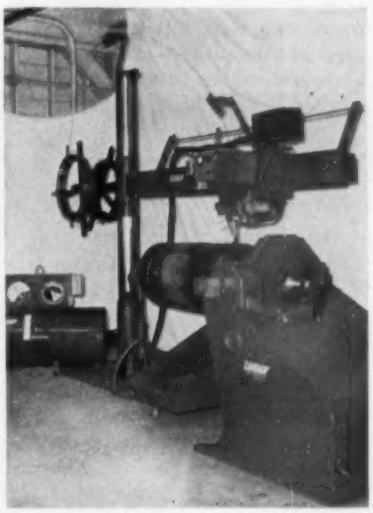
Perhaps an effective summary of the high points of this article can best be accomplished by means of an operator's trouble-shooting check list. Here it is:

Trouble-Shooting Tips

I. When arc instability is encountered:
   - *a.* Check the power supply line to determine if it is being overloaded.
   - *b.* Check the open-circuit voltage of the welding transformer.
   - *c.* Check the welding current and if possible raise it.
   - *d.* Investigate the use of smaller-diameter wire.

II. When poor weld bead contour is encountered:
   - *a.* Check the lead.
   - *b.* Check the rotational speed of the workpiece (usually set to establish a surface speed of from 20 to 30 ipm).
   - *c.* Check the welding current. (Excessive welding current causes excessive heat build-up).
   - *d.* Check the heat build-up in the workpiece. (Heat build-up is a function of welding current, the size of the workpiece and the elapsed welding time.)

III. Electrode crushing:
   - *a.* Check feed roll pressure.
   - *b.* Check feed roll wear.
   - *c.* Check the seating of the rod in the V-groove of the feed roll.



D-C WELDER is used for an automatic rebuilding job. Cylindrical workpiece is a dredge ladder roll

1—**MAINTENANCE tools themselves need maintenance. Here is the repair station**

2—**GEARS like the big ones in foreground are flame-hardened by this set-up. They will outwear untreated gears three to four times**

*Vital Tools for

Spectacular jobs attract attention. In steel mill maintenance, however, it is the day-to-day routine work (often repetitive) that pays the biggest dividends.

BY WALTER E. SCHAEFER

Development and Welding Engineer, Republic Steel Co., Gadsden, Alabama

GULFSTEEL Works of Republic Steel Corp., is an integrated steel plant, producing finished plates, pipe, bars, sheets, nails, fencing, and wire; concrete reinforcing, matt, bar joists, bolts and nuts. A battery of coke ovens, two blast furnaces and eight open hearths operate at full capacity to provide sufficient carbon steel to supply these various finishing mills. A blooming mill and rod mill roll the semifinished steel.

300 Men for Maintenance

Our plant contains complete shop and service facilities for maintenance. We can handle anything from the repair of delicate instruments to the rebuilding of blast and open-hearth furnaces. Nearly 300 men handle oxyacetylene equipment for maintenance purposes. The welding department has 48 employees while the rigger, machine, electrical, locomotive and car, pipe and boiler shops and the foundry each have a number of men who can cut, heat treat, gouge, weld, heat or melt with the oxyacetylene flame. Millwrights and motor inspectors, who are under the joint supervision of the maintenance superintendents and their own superintendents, make up the balance of the 300 men who daily work with an oxyacetylene flame.

For this crew of maintenance weldors, a central source of supply for acetylene and oxygen is provided. Liquid oxygen is delivered to a storage tank having a capacity of 1,500,000 cu ft. This system can deliver up to 100,000 cu ft per hour. For acetylene, there are three 300-lb and one 500-lb medium-pressure generators, but about one-half of the acetylene is purchased in cylinders. The acetylene and oxygen are distributed through pipelines to all major points. In addition, we have many portable oxyacetylene welding and cutting outfits to service locations where piped gases are not available. Over 100 welding and cutting outfits are in use as well as many other pieces of equipment that burn acetylene.

Maintenance for Maintenance

These maintenance tools are themselves subject to maintenance. Photo 1 shows our repair station for torches, regulators and allied equipment. All equipment is repaired in accordance with manufacturer's recommendations, using the proper replacement parts and tools. When the equipment leaves the repair station, it is equivalent to a new piece.

There are rare occasions where hundreds of pounds of steel, cast iron, bronze are used on a spectacular job. However, our maintenance work has been so organized that most jobs are handled on a routine basis.

Hardening and Hardfacing

Photo 2 shows an interesting job that saves money in the flame-hardening of gears. A tractor-type cutting machine supports the torch head and controls the speed of travel. The flame-hardening is done after finish machining. The operation is simple: the teeth are merely heated to a predetermined temperature and then quenched with water. This results in a hardened zone varying in depth up to approximately ⅛ in. The hardened metal resists wear approximately three to four times as long as an untreated gear.

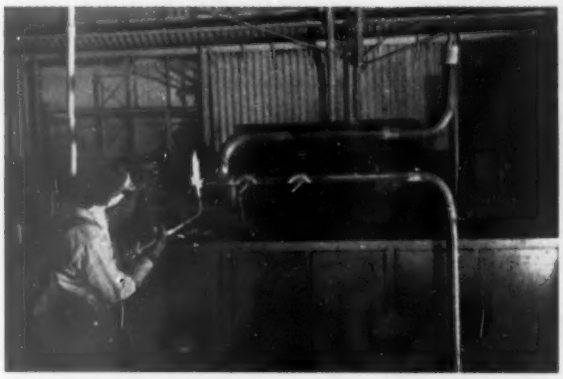
In the foreground of this picture are types of gears that are handled regularly: coke plant pusher drive gears of SAE 1035 steel, tilting table gears for the 112-in. plate mill and bevel gears of SAE 4340 alloy for

*Abstract of paper given at the annual meeting of the International Acetylene Association, Atlanta, Ga., April 13-15, 1953.

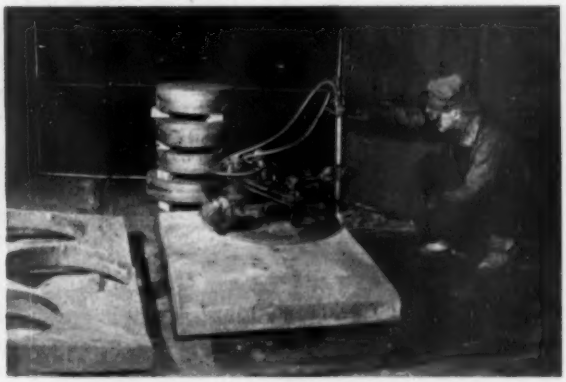
3—INGOT tong bits must be resurfaced frequently because they have to grip white-hot ingots. Alloy is chromium-cobalt-tungsten

4—HARDFACING restores the welding rolls after severe wear in the pipe mill

Vital Maintenance Jobs



5—PIPING is often fabricated. Here a header is being made for door frame of an open-hearth furnace



6—GEAR blanks of assorted sizes are flame-cut as required from steel plates of the proper thickness

7—GOUGING out a bearing of a plate mill. This cracked bearing was first welded on opposite side

8—POWDER cutting process (with an iron-aluminum powder) slices off a riser from a brass casting

9—WIRE rope is fused by welding torch so severed strands will not unravel. A smooth end results

10—AIR-ACETYLENE flame is used in the electric shop to solder on the commutator of a big mill motor

11—WELDING of cast-iron rolls for a bar mill required a skilled weldor—and considerable preheating

the blooming mill table rolls. These table rolls receive a slab rolled from a 48-in. square ingot on the 7,000-hp blooming mill.

Many wearing parts are hardfaced with special rods such as a chromium-cobalt-tungsten type. Photo 3 shows an operator applying the chromium-cobalt-tungsten rod to ingot tong bits. A heat-resistant alloy is needed because the tong points come into contact with hot ingots. The chromium-cobalt-tungsten alloy retains its hardness even at the high temperatures involved. Its value is especially apparent when charging cold ingots and removing hot ones. On straightening machine wire mill guides, the chromium-cobalt-tungsten rod is used because of its excellent wear resistance. When properly applied, this type of rod increases the life of the part as much as three to five times.

Photo 4 shows the method used to hardface the welding rolls of the pipe mill with oxyacetylene-applied chromium-cobalt-tungsten rod. These rolls wear rapidly under the combined action of heavy pressure, mill scale, high temperature and an abrasive welding flux. They are now resurfaced four to five times, bringing the total life of a roll to about fifteen times the life of a hardened alloy steel roll that is not resurfaced.

Another job that is performed by our apparatus repair department is the brazing of tungsten-carbide cutting bits to tool shanks. The oxyacetylene flame performs this job best because of its speed.

Piping, particularly small-diameter piping, must be replaced on many occasions. Here again the oxyacetylene torch is invaluable. Photo 5 shows a header being fabricated for a door frame of an open-hearth furnace.

Cutting and Gouging

Gear blanks of various sizes are cut from various thicknesses of material by portable cutting machines. A typical operation is illustrated in photo 6. These gear blanks can be cut very rapidly. The labor cost is only one-tenth that of a forged blank, and the quality is better than that of a cast blank.

I would like to point out at this time that our maintenance men are given best safety equipment and training. The result is that our accident frequency and severity are both low, and our employee relationship is good.

When equipment fails, it is necessary to weld it and get it back into service as quickly as possible. Before welding can be performed, however, the fracture must be properly prepared. In a great majority of such cases, we use oxyacetylene gouging to remove the metal in the form of a "U" so that the resultant weld will be completely solid. The flame-gouging technique is very flexible and is probably 15 to 20 times faster than pneumatic chipping guns. The gouging process is also valuable for the removal of defects from castings and welds. In photo 7, a cracked bearing for a plate mill is being gouged after having been welded on the reverse side.

Another valuable maintenance tool, powder cutting, is shown in operation in photo 8. By introducing an iron-and-aluminum powder mix into the reaction zone, it is possible to cut up refractory metals such as cast iron, brass, bronze, copper, stainless steel and sand-encrusted castings. Illustrated here is the removal of a riser from a brass casting.

A very interesting little job is shown in photo 9. The rigger is fusing a wire rope so that the strands will be welded together and not become unraveled. All crane cables are cut in this manner. The cutting, which is really melting, is accomplished by using only the preheat flames of a cutting torch.

In the machine shop, oxygen and acetylene are utilized in a somewhat different fashion in the process of metal spraying. The application of this process is being extended by an oxyacetylene reflow operation following the spraying. The resultant coating outlasts five hard chromeplated plungers on Kobe pumps of 2,500 psi.

In the electric shop, the air-acetylene flame is popular. Photo 10 shows its use in soldering on a commutator of a mill motor. Another job was to silver solder brass studs in the back of contact tips for the controls of the blast-furnace skip hoist.

In the welding shop, we find considerable braze welding going on. A nail machine frame was braze welded with only torch preheating. The cast-iron bar mill rolls in photo 11, however, required considerable preheat. Wobblers are built up by skilled oxyacetylene operators so that no machining or grinding will be required. Roll surfaces are also built up when a small section has been broken out.

The production of piping of large diameter requires copper chill bars.

These were originally made by drilling solid copper bars to provide passages for cooling water. After about one-third of the copper had been worn off, the water passages would become exposed, and the bar had to be scrapped. Photo 12 shows the new method: milled-out steel plates are oxyacetylene soldered to solid copper bars, enabling us to use nearly all of the copper. The steel part of the bar is used over and over, whenever it is necessary to make a new chill.

The boiler shop has flame-cut and weld fabricated nearly every type of structural component required in the district that can be made from plates and slabs. In conjunction with other departments, this shop rebuilds or makes everything from open-hearth buckstays to charging machines, from open-hearth doors to scrap cranes, from pan cars to refuse dump cars and from building columns to blast furnace tops.

I believe these illustrations indicate how extremely valuable a tool the oxyacetylene flame is in steel-mill maintenance. With it, parts can be surfaced with special alloys to increase wearability and corrosion resistance. Cast-iron parts can be repaired: either by fusion welding with cast-iron rod or by braze welding with bronze rod. Almost all metals and alloys — aluminum, stainless, Monel and nickel—can be oxyacetylene welded. Oxygen and acetylene gases can also be used for flame-hardening, flame-softening and flame-strengthening and to remove paint and scale from old steel so that the surface is excellently prepared for repainting.

12—CHILL bars for pipe production are made by soldering copper bars to milled-out steel plates

SEE-MANSHIP IN SELLING

(Continued from page 38)

literature. All of you have literature, for I have seen stacks of it around the country. The point I wish to emphasize is that very few distributors *use* much literature. At least, I have not noticed much use of it.

For the distributor or the salesman who wants to increase sales, there isn't a better or less expensive way to do it than through promotional literature. Perhaps the reason we don't do a better job of it is because we don't realize the real value of it—what it can do to stimulate and accelerate sales. We think we must get out and talk—talk—talk.

To get back to the importance of the things that our eyes tell us, imagine the trouble you would have trying to sell a welding machine to a blind man who had never before seen one. Yet many salesmen seem to work on the basis that their prospects are blind. They might as well ask the prospect to close his eyes while they are trying to sell.

Barehanded Salesmen

Silly? Of course. And so is the salesman who goes on a call with just his bare hands. *His* customer might as well be blind for all he will learn and remember of the salesman's visit. *The only time a salesman should be barehanded is when he shakes hands.*

Can you think of anything more empty than watching a television set with the picture blacked out? Well, that is just the way a salesman is operating when he goes in to talk to a prospect with nothing to show.

Printed literature offers a tremendous opportunity to take advantage of the effectiveness of visual selling. All manufacturers of welding equipment have available printed literature. Most of them offer full-line catalogs, single pages, mailing pieces, envelope stuffers, service bulletins, etc. All of these different pieces of literature have a definite place in your visual selling program. You know how to use them—but do you do it?

Methods of distributing printed matter will vary according to the size of your operation. I know a distributor who operates largely from route trucks and has only one direct salesman. The drivers are on the run all the time and have little if any time to sell. This distributor has the route men hand out envelope stuffers at every stop. If the customer is out, he wraps a piece of literature around the regulator and holds it in place with a rubber band. This kind of a program is carried on once a month, and at the end of the year they have put a tremendous amount of literature into the hands of their customers.

Pictures Made Attractive

Another distributor has had large 8 by 10 pictures taken of various sections of his store. He mounts these on stiff cards with a cellophane cover over them. The driver-salesmen carry sets of these photographs and show them to their customers. It's a neat way to point out the good stocks that the distributor carries of various items. Many a customer never darkens your door and has no idea of the investment and stock you carry.

Down in the good state of Louisiana, the Braun Welding Supply has done a clever job of promotion on a limited budget. Mrs. Braun has a lot of artistic ability at drawing pictures of the female sex. By using Government postal cards and doing their own work, the Brauns devised a series of mailing pieces that were most effective. I understand these postal cards almost became collectors' items. Each of them told a product story.

Edits His Own

There is a growing interest among distributors in getting out their own publications and house organs. Paul Haygood, of the Louisiana Welding Supply, Baton Rouge, has put out a small house organ that has produced direct sales he can trace. Other distributors are doing the same with good results.

Yes, there are many ways to use printed literature, all of them effective. The voice of authority carried by printed literature is far more potent than the spoken word. This valuable asset is often overlooked, and yet all of us are willing to accept the written word before we will the one that is spoken. Alert sales people are aware of this fact and use literature to back up their statements. The most successful salesmen take great care to make their selling statements agree with product literature.

I would like to remind you in closing that your suppliers are offering you, free, printed literature worth hundreds of dollars. Correctly used, it can bring in many thousands of dollars worth of additional sales.

STANDARD farm implements are fine for the farmer who grows major crops but must be altered to meet the requirements of such crops as avocados and lettuce

ENOUGH spare parts to make *all* the changes that customers might require simply cannot be stocked by farm implement dealers who wish to stay in business

Farm Implements

When you buy a ready-made suit, a tailor alters it to fit your individual measurements. Aided by welding, the farm implement dealer can now offer the same service.

BY THOMAS A. DICKINSON

IN THE manufacture of farm implements, as in the manufacture of automobiles and airplanes, a certain amount of design standardization is necessary to produce a mass market. In order to sell tractors to the great majority of farmers, who cannot afford to pay more than $2,000 for one, such a manufacturer as the International Harvester Co. must concentrate on the production of a few specific models that will meet the requirements of farmers growing major crops—wheat, corn, cotton, etc.

This is fine for the farmers who grow our more important crops since they can buy farm implements right out of stock that will do what they want them to do. Unfortunately, many of the most profitable crops are not required in large quantities, and they cannot be produced with implements of the types used for the cultivation of major crops. For instance, the grower of celery can't make use of a standard crop-dusting machine because the wheel base is too narrow to permit operation in a celery field without considerable damage to the crop.

If the celery grower has an abundant supply of cheap labor, it would be a simple matter for him to dust his crop without machinery. If he had access to an unlimited supply of capital, he would, no doubt, find it worthwhile to have his crops dusted by airplane or to have the implements he needs made to order at various machine shops. Farmers in general, however, are neither wealthy nor blessed with a plentiful supply of low-cost labor. So what can be done?

HERE'S ONE ANSWER

The Southern Equipment and Supply Co., San Diego, Calif., is convinced that the answer to this question consists in making effective use of welding equipment. It has proved a very profitable answer—both for farmers and for the retailers who sell farm implements.

Says Clifton Coates, Southern Equipment's sales manager:

"It's simply a matter of using welding equipment to alter or rebuild standardized farm implements so that the implements will meet the requirements of specialized farmers."

Coates, it should be noted, is the current president of the California Farm Implement Dealers' Association.

Welding equipment is nothing new to the average farm implement dealer. Like the automobile dealer, he learned long ago that it is not practical to sell expensive machinery without a plan and facilities for giving customers repairs and servicing as needed. Accustomed as they are to the use of welding equipment for repair operations, however, many implement dealers have to date been reluctant to alter the equipment they sell.

"How can we afford the ill-will we might create if we didn't do a good job?" they reason. "How, for instance, could we expect to sell a new tractor to a farmer if his last machine had a broken axle every week or two after we widened the wheel base?"

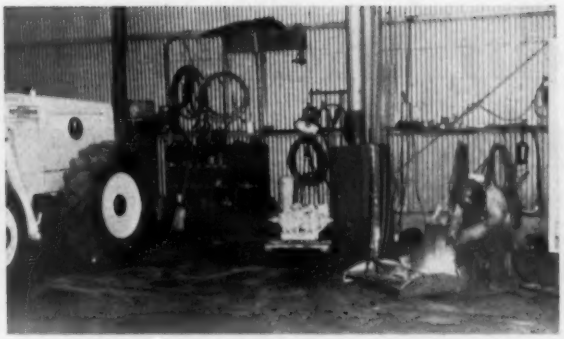
The farm implement dealer knows he is capable of doing a good repair job. He is not convinced, however, of his abilities as an engineering designer of farm machinery. There's still a big gap to span between the customer's need for such a service and its availability.

Meanwhile, implement manufacturers, anxious to broaden their markets, are attempting to solve the problem by designing their products so as to facilitate alterations. They are also training field engineers to help dealers' service personnel adapt equipment to the requirements of specialized customers.

"Most dealers," says Cliff Coates "can get sound advice from the manufacturers who produce their equipment if they will only ask for it."

Coates believes it's worth the dealer's while to take the extra trouble

WELDING and flame-cutting equipment has long been used by implement dealers to make repairs. Most of them have the facilities needed for remodeling jobs



SPECIAL accessories, made to order for customers' machines, constitute a step in the right direction—and represent a profitable use of welding for the dealer

Tailored to Fit

because farmers needing special equipment are usually in a position to pay for whatever alterations may cost. As an example, an avocado grower can afford to pay a substantial sum to have the body of a conventional tractor lowered two feet (necessary for use in an avocado grove) because the grower earns a much larger margin of profit per acre than the wheat or cotton farmer.

Where Welding Comes In

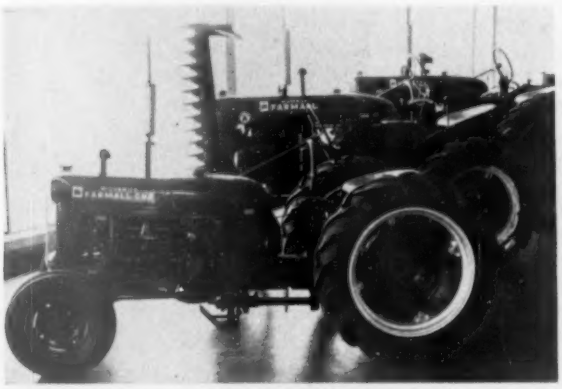
Welding equipment is especially important in the reconstruction of farm implements. It simply would not be economically possible for a manufacturer to make (or a dealer to stock) all the special parts that might be required. To be able to supply tractors of varying wheelbase dimensions, for example, it would be necessary to have a dozen or more different axles and housing units in order to anticipate every possible alteration without using welding equipment. Most of these sizes would probably have to be held several years before they were needed. Stocking them would be foolish in view of the fact that:

(*a*) Oxyacetylene cutting torches can remove excess materials from standard parts that must be shortened or dissect parts that must be lengthened.

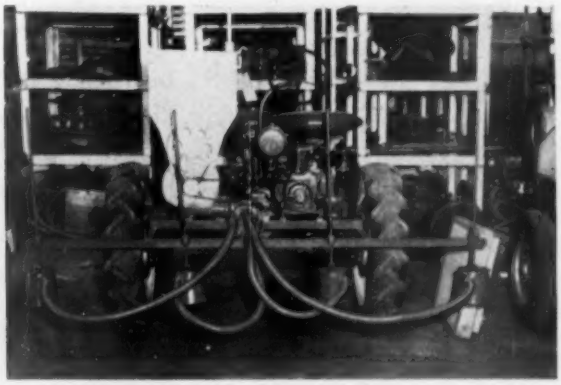
(*b*) Arc-welding equipment can be used to reassemble or reinforce components that have been tailored to fit the particular job with a gas torch.

A number of small implement dealers who are unable to afford extensive repair-shop facilities have made use of oxyacetylene equipment for operations in both welding and cutting. Larger dealers, however, apparently feel that the supplemental use of arc welding is justified in terms of increased operational efficiency.

Few, if any, implement dealers are yet utilizing inert-gas equipment. This is natural in view of the fact that mostly plain-carbon steels are used in the manufacture of farm equipment. Some dealers, however, have found it practical to use resistance-welding equipment for the fabrication of special accessories that can be sold to a considerable number of farmers in their respective areas. One Southern California dealer, for instance, is using spot welding in the production of spray rigs for citrus growers.



FINAL step is to alter standard farm equipment. The three tractors shown here were all the same size when they were delivered to Southern Equipment and Supply



WHEELBASE of this duster was altered in length by welding and cutting. It is now suited to the special requirements of a Southern California celery grower

on the job

Courtesy Air Reduction Sales Co.

MIG welding job: depositing a 2-in.-wide overlay of aluminum bronze on the inner surface of a steel sleeve

COOL DIVE: Platform at Hotel St. George, Brooklyn, was made by bending and welding stainless tubing

Production Was Tripled

NATIONAL Rubber Machinery Co., Clifton, N. J., has more than tripled the production rate of aluminum-bronze overlays on piston recoil sleeves for tank guns by using Mig (metal inert-gas) welding. The company is also getting improved quality of deposit at reduced costs.

The sleeve acts as a cylinder, in which the barrel of the 90-mm gun (acting as the piston) goes back and forth at relatively high speed. Sleeve is made of 4130 steel and is 10 in. in diameter, 32 in. long and has a wall ⅝ in. thick. The overlay serves as a bearing surface to reduce friction. It is made on the inside of the sleeve in a circumferential groove machined ⅛ in. deep and 2 in. wide.

Deposition of aluminum-bronze wire is made with a manual welding gun at a feed speed of 200 ipm. Argon flow is 30 cfh. Current is 250-300 amp, d-c reverse polarity; voltage is 32-40 volts.

The operator deposits a bead an inch wide while a foot-controlled welding positioner rotates the sleeve. A second bead, adjacent to the first, is made on the second rotation. Actual deposition time for the two circumferential beads is approximately 20 minutes. The deposit is built up slightly above the surface of the sleeve's inner wall to allow for finish machining. Then the assembly is heat treated after welding to obtain the specified hardness of the 4130 shell.

When manual arc welding was used to do this job, 6 lb of coated electrodes were required. Now only 2½ lb of wire in bare coil form are required for each sleeve. The saving comes from the elimination of stub-end loss and the reduction of spatter to a minimum. Use of the inert-gas shield means no slag removal and no slag inclusions. In addition, the concentrated heat input results in excellent fusion of the overlay with the chrome-moly steel sleeve.

National Rubber Machinery Company is now turning out 13 to 15 sleeves a day in comparison with four a day obtained by the previous method. The company is so pleased with the results that it is now considering Mig welding to displace the metal-spraying process now being used to apply a 13½-in.-wide aluminum-bronze circumferential band on the outer wall of the piston recoil sleeve.

* * *

De-flanging Railroad Wheels

REMOVAL of flanges from heavy cast-iron railroad car wheels is one of the latest jobs assigned to the arc-air cutting and gouging torch. Weyerhaeuser Timber Co., Enumclaw, Wash., needed railroad wheels without flanges—they needed a lot of them, 176 to be exact.

The job had been done before, but the ordinary melting and cutting methods used left a rough edge on the wheel.

Art Petersen, machine shop foreman at the timber company's White River branch, thought the arc-air torch would do this job. It did. One man was able to "de-flange" over four wheels a day by gouging both sides with the torch and then breaking off the flange with a blow from a sledge. A neater job resulted, saving additional time.

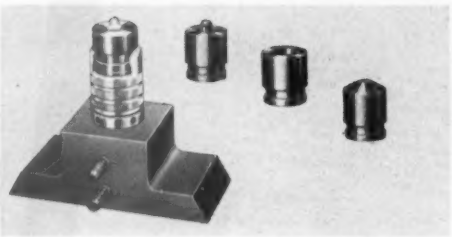
In the picture at bottom right, Weldor Lloyd Morisch shows how the cast-off wheels were converted for use as undercarriages for heavy logging equipment. The torch uses a carbon arc with compressed air. Its simple principle is to direct a jet of air at the arc. The arc melts the metal while the air jet blows the molten metal away before it can reharden.

Courtesy Arcair Co.

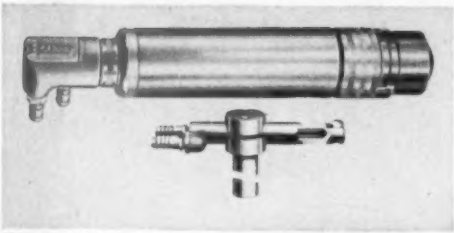
GOUGING off flanges of car wheels

For All Your Resistance Welding Needs ...CALL MALLORY!

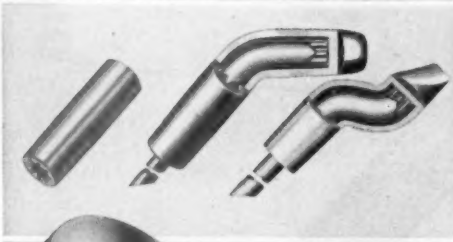
Mallory resistance welding supplies and services can meet all your requirements — whether for simple electrodes, or complicated, custom-built dies.



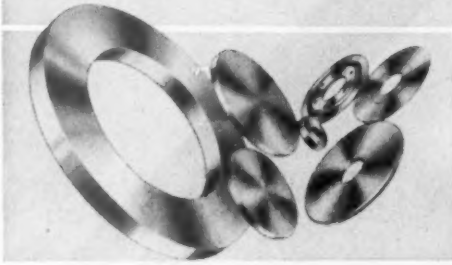
MALLORY "NU-TWIST*" DIE ADAPTORS. Now, you can change resistance welding die set-ups in a matter of seconds. By using different electrodes in the "Nu-Twist" die adaptor you can handle several resistance welding jobs with only one die set-up. A variety of electrode insert blanks is available from stock. Special shapes can be custom made.



MALLORY HOLDERS. Standard holders, available from stock, can be combined to handle practically any resistance welding job requiring extremely light pressures to over 6000 pounds. Mallory "Nu-Twist" and "Premium" holders will perform in the high pressure ranges needed for welds to meet all military specifications.



MALLORY FLUTED ELECTRODES*. Available in standard, straight, single and double bend off-set shapes, Fluted Electrodes—a Mallory exclusive—offer a 70% increase in cooling area . . . faster heat dissipation . . . positive tube centering . . . all at no extra cost. You get longer life, more uniform welds, less down time, more welds per dollar.



MALLORY SEAM WELDING WHEELS. Forged from Mallory developed alloys, these seam welding wheels are available in sizes to meet all machine requirements. They are machined to exacting tolerances . . . cast and forged under rigid controls. You get stronger, more consistent welds . . . fewer interruptions for dressing.

*Trade Mark, Patent Applied For

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario

RESISTANCE WELDING ELECTRODES, HOLDERS, RODS AND BARS, DIES, CASTINGS, FORGINGS, ACCESSORIES

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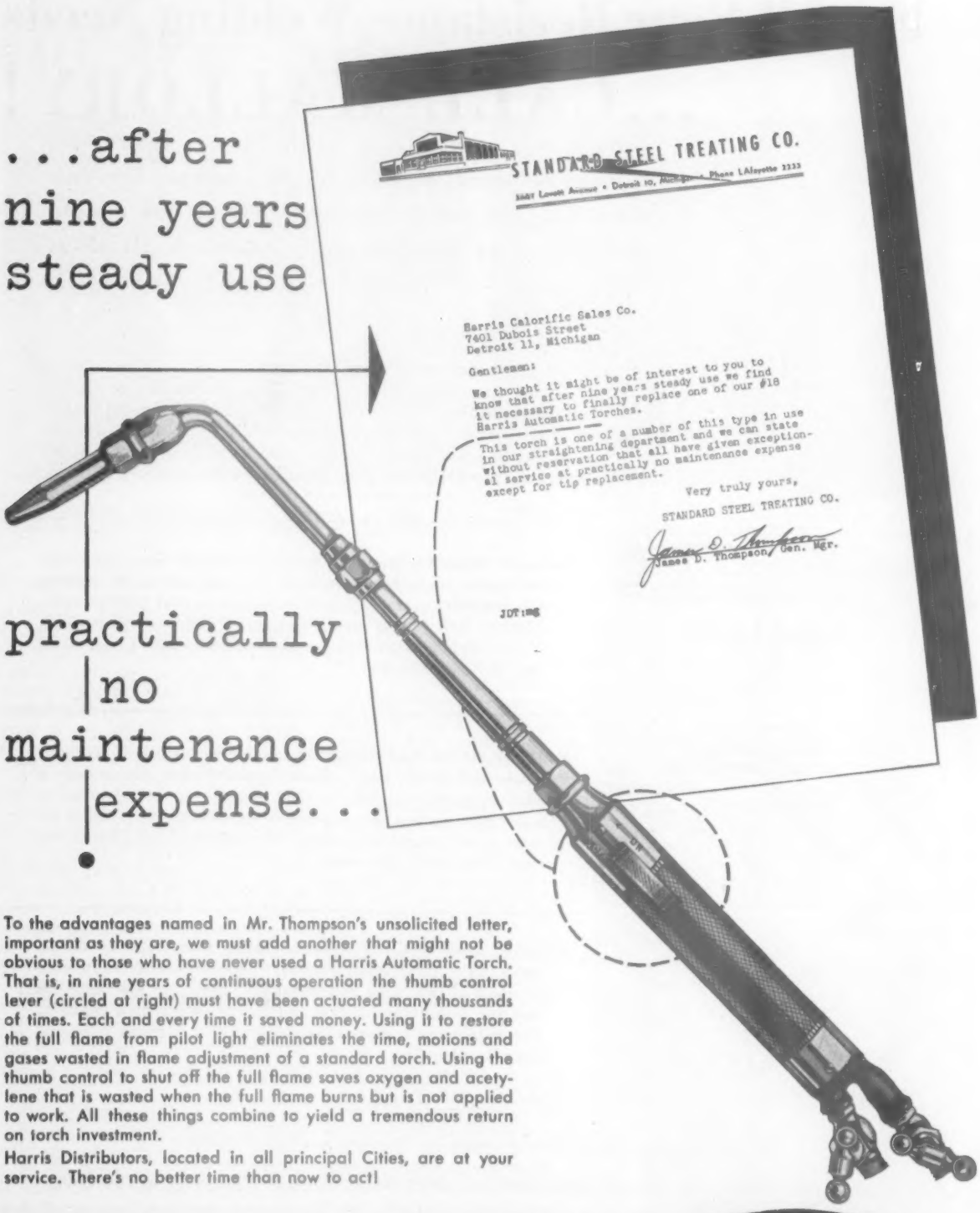
For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

...after nine years steady use


STANDARD STEEL TREATING CO.
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.

practically no maintenance expense...

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

THE HARRIS CALORIFIC COMPANY

Cleveland 2, Ohio

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905

Specifications for Brazing Filler Metal

AWS-ASTM Specification B260-52T

Aluminum–Silicon

AWS-ASTM Classification	Silicon, per cent	Copper, per cent	Iron, per cent	Zinc, per cent	Magnesium, per cent	Manganese, per cent	Chromium, per cent	Titanium, per cent	Aluminum, per cent	Other Elements—Each, per cent	Other Elements—Total, per cent
BAlSi-1	4.0 to 6.0	0.30	0.80	0.10	0.05	0.05	...	0.20	remainder	0.05	0.15
BAlSi-2	6.8 to 8.2	0.25	0.80	0.20	...	...	...	...	remainder	0.05	0.15
BAlSi-3	9.3 to 10.7	3.3 to 4.7	0.80	0.20	0.15	0.15	0.15	...	remainder	0.05	0.15
BAlSi-4	11.0 to 13.0	0.30	0.80	0.20	0.10	0.15	...	...	remainder	0.05	0.15

Copper and Copper-Zinc

AWS-ASTM Classification	Copper, per cent	Tin, per cent	Iron, per cent	Manganese, per cent	Nickel, per cent	Phosphorus, per cent	Lead, per cent	Aluminum, per cent	Silicon, per cent	Silver, per cent	Zinc, per cent	Other Elements—Total, per cent
BCu	99.90 min[a]	...	...	...	...	0.075	0.02	0.01	...	...	...	0.10
BCuZn-1	58.0 to 62.0	...	...	...	...	...	0.05	0.01	...	...	remainder	0.50
BCuZn-2	57.0 min	0.25 to 1.0	...	...	...	...	0.05	0.01	...	...	remainder	0.50
BCuZn-3[b]	56.0 min	1.1	0.25 to 1.25	1.0	1.0	...	0.05	0.01	0.25	...	remainder	0.50
BCuZn-4	50.0 to 55.0	...	0.10	...	...	...	0.50	...	...	...	remainder	0.50
BCuZn-5	50.0 to 53.0	3.0 to 4.5	0.10	...	...	...	0.50	...	...	...	remainder	0.50
BCuZn-6	46.0 to 50.0	...	0.25	...	9.0 to 11.0	...	0.05	0.005	0.15	...	remainder	0.50
BCuZn-7	46.0 to 48.0	...	...	...	10.0 to 11.0	0.20 to 0.50	...	...	0.15	0.30 to 1.00	remainder	0.10

[a] Copper plus silver.
[b] RCuZn-B and RCuZn-C welding rod (see Tentative Specifications for Copper and Copper-Alloy Welding Rods (ASTM Designation: B 259; AWS Designation: A 5.7)) meet these requirements. BCuZn-3 brazing filler metal can be used as RCuZn-B or RCuZn-C welding rod only if it meets the specification requirements of these rods.

Heat-Resisting Materials

AWS-ASTM Classification	Nickel, per cent	Chromium, per cent	Boron, per cent	Iron, per cent	Silicon, per cent	Carbon, per cent	Silver, per cent	Manganese, per cent	Other Elements—Total, per cent
BNiCr	65 to 75	13 to 20	2.75 to 4.75	[a]	[a]	[a]	...	...	0.50
BAgMn	...	...	...	...	...	...	84 to 86	14 to 16	0.15

[a] Total iron plus silicon plus carbon = 10.0 max.

Copper-Phosphorus

AWS-ASTM Classification	Phosphorus, per cent	Silver, per cent	Copper, per cent	Other Elements—Total, per cent
BCuP-1	4.75 to 5.25	...	remainder	0.15
BCuP-2	6.75 to 7.50	...	remainder	0.15
BCuP-3	6.00 to 6.50	4.75 to 5.25	remainder	0.15
BCuP-4	6.75 to 7.80	5.75 to 6.25	remainder	0.15
BCuP-5	4.75 to 5.25	14.50 to 15.50	remainder	0.15

Magnesium

AWS-ASTM Classification	Aluminum, per cent	Manganese, per cent	Zinc, per cent	Silicon, per cent	Copper, per cent	Nickel, per cent	Magnesium, per cent	Other Elements—Total, per cent
BMg	8.3 to 9.7	0.10 min	1.7 to 2.3	0.3	0.05	0.01	remainder	0.03

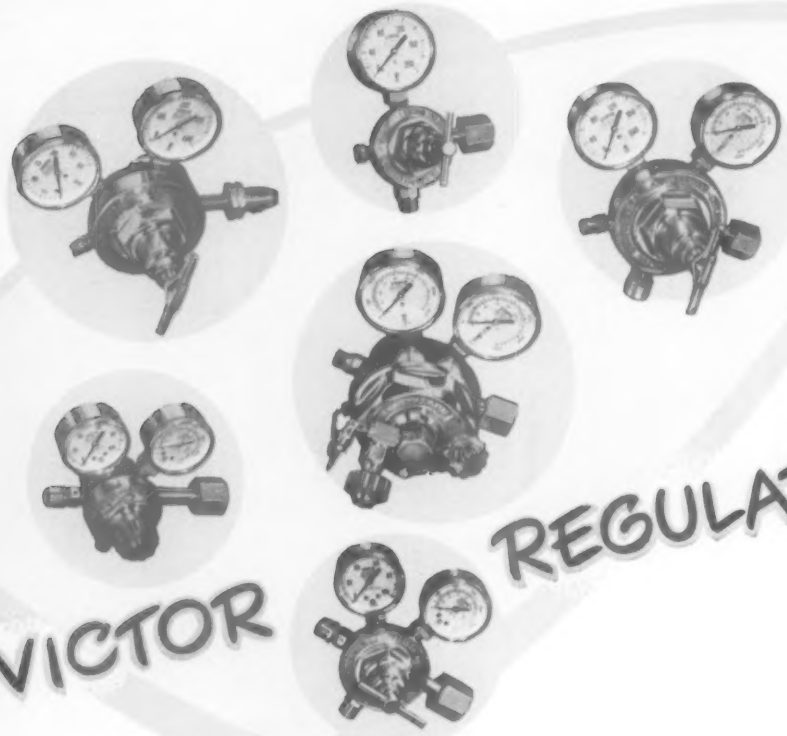
Silver

AWS-ASTM Classification	Silver, per cent	Copper, per cent	Zinc, per cent	Cadmium, per cent	Nickel, per cent	Tin, per cent	Other Elements—Total, per cent
BAg-1	44 to 46	14 to 16	14 to 18	23 to 25	...	...	0.15
BAg-2	34 to 36	25 to 27	19 to 23	17 to 19	...	...	0.15
BAg-3	49 to 51	14.5 to 16.5	13.5 to 17.5	15 to 17	2.5 to 3.5	...	0.15
BAg-4	39 to 41	29 to 31	26 to 30	...	1.5 to 2.5	...	0.15
BAg-5	44 to 46	29 to 31	23 to 27	...	...	...	0.15
BAg-6	49 to 51	33 to 35	14 to 18	...	...	...	0.15
BAg-7	55 to 57	21 to 23	15 to 19	...	...	4.5 to 5.5	0.15
BAg-8	71 to 73	27 to 29	...	...	...	...	0.15
BAg-9	64 to 66	19 to 21	13 to 17	...	...	...	0.15
BAg-10	69 to 71	19 to 21	8 to 12	...	...	...	0.15
BAg-11	74 to 76	21 to 23	2.5 to 3.5	...	...	...	0.15

Copper-Gold

AWS-ASTM Classification	Gold, per cent	Copper, per cent	Other Elements—Total, per cent[a]
BCuAu-1	37.25 to 37.75	remainder	0.005
BCuAu-2	79.75 to 80.25	remainder	0.005

[a] These alloys shall not contain more than 0.005 per cent volatile impurities such as zinc or cadmium, and should be available oxygen-free, if so specified by the purchaser.



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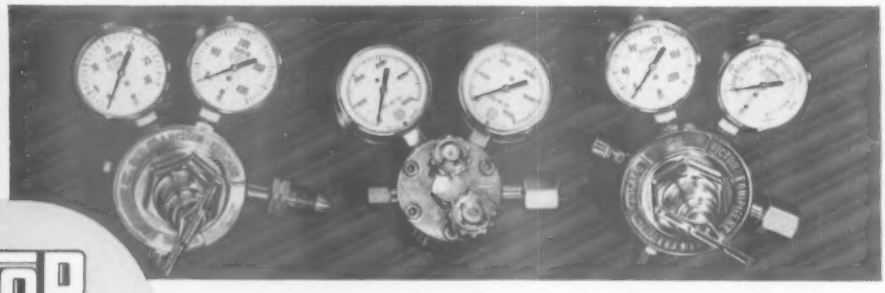

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One Sure Way to Get MORE DEFENSE FOR LESS MONEY

How can we get more national defense for less money? The best answer yet given to this question appears in a little-noticed section of the new defense budget. That answer, with which this editorial is concerned, is to provide more equipment with which to step up munitions production in an emergency. Thus we can eliminate much of the need to stockpile finished munitions in advance.

The new defense budget provides an appropriation of $500 million, to be invested by the Secretary of Defense in specialized facilities required to produce munitions on a wartime scale, but not adapted to profitable operation by private industry in normal times. Facilities of this type are known as "stand-by capacity."

There is no strictly political controversy over the "stand-by capacity" program. It was originally suggested by Clay Bedford, Special Assistant to the Secretary of Defense during the Truman administration. It has since been reviewed and endorsed by the Eisenhower administration. Moreover, it involves little or no technical controversy. Civilian and military experts are well agreed that the only alternative to enormous expenditures for stockpiling military equipment is to provide enough facilities for producing it quickly in an emergency.

Here is the Key Idea

In his speech of May 19, introducing his defense budget to Congress and the nation, President Eisenhower stressed the value of such reserve capacity in these terms, ***"The more swiftly and smoothly we can mobilize, the less our dependence upon costly standing armies and navies."***

In accord with this idea, the $500 million requested for the present reserve capacity program would be invested in tools that require a long time to produce, and so present grave complications in an emergency unless they are ready in advance. Some such tools would be installed in new plants that are needed to eliminate potential bottlenecks in the defense production program. Others would be ordered to replace that part of the government's present machine-tool inventory which is made obsolete by changes in the design of defense products. By completely "tooling up" with the most modern equipment, the admin-

istration hopes to realize a production potential many times greater than could be achieved by spending the same amount of money on military end-products.

Examples of Savings

In the specialized field of defense production, adequate modern capacity is the key to both economy and speedy delivery in a pinch. Here are some striking examples from the recent report of the Advisory Committee on Production Equipment (Vance Committee) to the Director of Defense Mobilization:*

—In the case of certain ammunition components, the cost of new capacity can be recovered in only six weeks of full production.

—If $500 million worth of special tools needed to make aircraft are purchased in advance, aircraft production during the first two years of war will be increased about $18 billion. In other words, it costs 1/36 as much to acquire the tools in advance as to acquire the aircraft.

—In the case of a certain ordnance item, an expenditure equal to the cost of only 150 units of the item will provide the capacity to produce thousands and save three years' time in meeting mobilization requirements.

Moreover, reserve plants and equipment can be kept up-to-date at only a small fraction of the cost required to maintain an up-to-date reserve of military end-products. The cost of replacing 5,000 obsolete tanks is at least $1 billion. The cost of new tools for a tank plant would be less than 10% of that amount.

*This Committee, headed by Mr. Harold Vance, President of the Studebaker Corporation, included Clay Bedford, then President of Chase Aircraft, Manly Fleischman, former Defense Production Administrator, and several retired military leaders with wide experience in procurement.

Savings Will Multiply

On the basis of facts like these, the Vance Committee recommended that the Defense Department spend $500 million to $800 million per year on specialized defense production facilities in order to provide substantial reserve capacity as soon as possible. It also recommended that expenditures for military end-products which get obsolete rapidly be held to a minimum. The Eisenhower administration has adopted this approach to the problem of munitions production in asking that $500 million be invested in reserve capacity.

The importance of this approach is much greater than is indicated by the amount of money to be spent on new tools, although this amount will go far toward assuring a healthy machine tool industry, adequate to meet emergency demands. ***What is really important is the great saving that can eventually be made in the cost of our defense program by a modern tooling program.*** If we are to maintain this program for a long period, and if we are to pay as we go, we must have a low-cost program. No other plan to reduce and control the cost of a garrison economy can compare with the new approach suggested in the Vance Report and now embodied in the new defense budget.

Congressmen will do well to scrutinize all military appropriations carefully. They have a chronic tendency to be too big. But there should be no penny-pinching on investments in capital equipment that will pay out in as short a time as six weeks in a war emergency. It would be tragic if this opportunity for real economy were lost in the controversy over other aspects of the defense program. ***The tooling program is a key part of the Eisenhower effort to cut defense costs. It should be promptly approved.***

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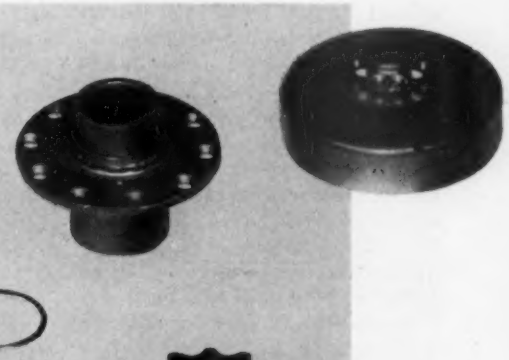

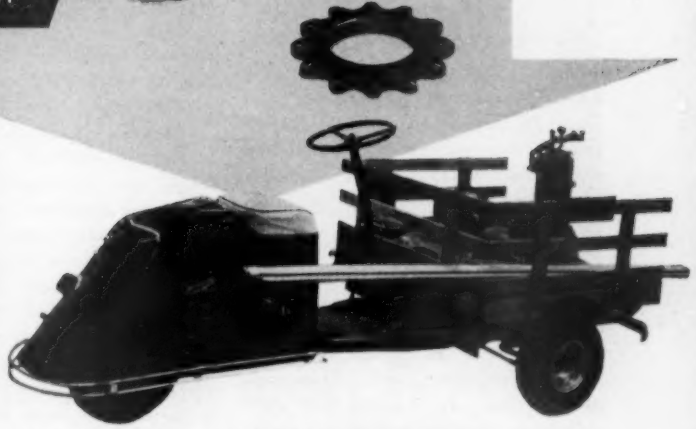

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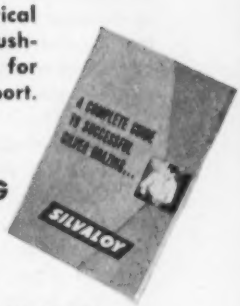

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(Continued from page 26)

The specimens were welded by pressing the faying surfaces together between heated circular dies held at various test temperatures. Die indentations were held to between 5 and 10% of the sheet thickness; this assured physical contact yet prevented severe interfacial deformation.

By maintaining a bonding diameter-sheet thickness ratio of less than three to one, shear-type failure could be effected in lap specimens made at various temperatures, thereby permitting the true shear strength of the interfacial metal to be determined. The shear strength of recrystallization welds were discovered to be equivalent to those of spot welds and in agreement with the shear strengths of the annealed parent metals.

Stranded Electrodes

Harold Robinson, formerly of the Kaiser Aluminum & Chemical Sales Co., and H. C. Cook, of Air Reduction research laboratories, contributed a joint paper describing a new way of making electrode wire for metal inert-gas (Mig) welding.

There are many materials that are difficult or impossible to manufacture in small-diameter wires. One excellent example is provided by aluminum bronze having an aluminum content exceeding 10%. The commercial aluminum bronzes with high aluminum contents undergo a series of swaging and annealing operations that preclude them from being drawn into wires of the small sizes and continuous lengths required for Mig welding. Many hardfacing materials fall into a similar category and are therefore not available to this welding process.

A project was undertaken to find a composite method of making small-diameter wires of aluminum bronze. The first method tried was to place a bar of 2S aluminum in a tube of high-purity copper. This composite was then rolled and drawn down to 1/16-in. wire. The method had to be discarded because of the limitation on length in manufacturing and the difficulty of introducing a third element (iron) into the wire.

The second method was to roll-form a wrap-around copper strip for an aluminum core wire. Continuous lengths are easily made, and the composite can be readily drawn down to the sizes required for Mig welding. This method also had to be discarded because of the difficulty of introducing an iron addition.

The stranding method, the one now being used to manufacture electrodes commercially, has apparently overcome the disadvantages of the earlier methods. A number of wires of copper, aluminum and iron are stranded together to produce a composite electrode. The iron, in the form of a very fine wire, is placed in the center of the strand to protect it from premature melting and unraveling from the radiant heat of the welding arc. Though the nominal size of the stranded electrode is 5/64 in., its true cross-section is about the same as a 1/16-in. solid wire.

The stranding method of producing electrodes is very flexible. Change from one alloy to another is simply a matter of drawing the individual wires to the proper diameter and setting the stranding machine for the predetermined strand design. The composition of such a composite electrode is constant throughout its length and from spool to spool.

Besides aluminum bronze, the high lead-tin-copper materials used for bearing overlays or to repair cast bearings also lend themselves admirably to stranding. Normally, these alloys are cast in large-diameter rods —up to ½ in.—and applied with the carbon-arc or as a bare electrode. With the composite method, an extruded lead-tin solder wire is surrounded in the strand by several fine copper wires. The soft solder core is so completely enveloped by the copper that it does not melt until it enters the arc, at which time the copper and core wires melt and mix uniformly.

Automatic Girth Joints

Perry C. Arnold, welding engineer of Chicago Bridge and Iron Co., had an interesting paper on how the girth joints of large storage tanks are being welded in the field with automatic equipment. Many years ago, Chicago Bridge and Iron discovered the submerged-arc process could deposit weld metal horizontally on a plate held in a vertical position. Several welding heads were available that would perform this type of work, but no one had invented a suitable carriage. Chicago Bridge and Iron decided to develop the carriage and other pertinent details that would make the automatic welding of girth joints possible and practical.

The essential parts of an automatic girth machine are a powered, variable-speed carriage, two fully automatic welding heads, power for operating them and a means of supporting the flux during welding. The two welding heads are mounted on the carriage with the guiding devices, reels of wire, electrical controls, etc. The carriage travels around the tank by using the upper edge of the shell plate (accurately machined) as a track. Tanks as large as 330 ft in diameter and as small as 26 ft have been successfully girth welded with this automatic equipment.

Preheating torches precede each welding arc, to bring the abutting plate edges up to approximately 300 F prior to welding. It was found advisable to preheat in order to: (1) slow up the cooling rate of the weld metal, (2) eliminate any moisture present in the joint and (3) flame-clean the plate edges.

After the first girth-welding unit had been built, there followed a long, time-consuming period of development and testing. Some of the bugs that had to be ironed out concerned the variables: *(a)* design of the welding groove, *(b)* rate of travel, *(c)* current settings for plate thicknesses of from ¼ to 1½ in., *(d)* welding of outside and inside seams—at different times or simultaneously; *(e)* proper size and type of electrode wire, *(f)* grades and sizes of flux, *(g)* proper distance of one electrode behind the other, *(h)* angle of inclination of electrode into puddle and *(i)* arc lengths or voltage settings.

Today, all of these problems have been licked, and Chicago Bridge and Iron has over thirty units in operation to field weld the girth joints of every storage tank 100 ft or over in diameter and many smaller tanks as well (picture on page 6).

Welded Ship Repairs

Tricky problems in the repair of steel ships by welding were discussed by Milton Forman, welding engineer of the Brooklyn Division of Todd Shipyards Corp. One of the specific problems he told about was the renewal of the entire bottom of a cargo ship.

When you are building a new ship, said Forman, relative freedom exists for contraction to take place. In

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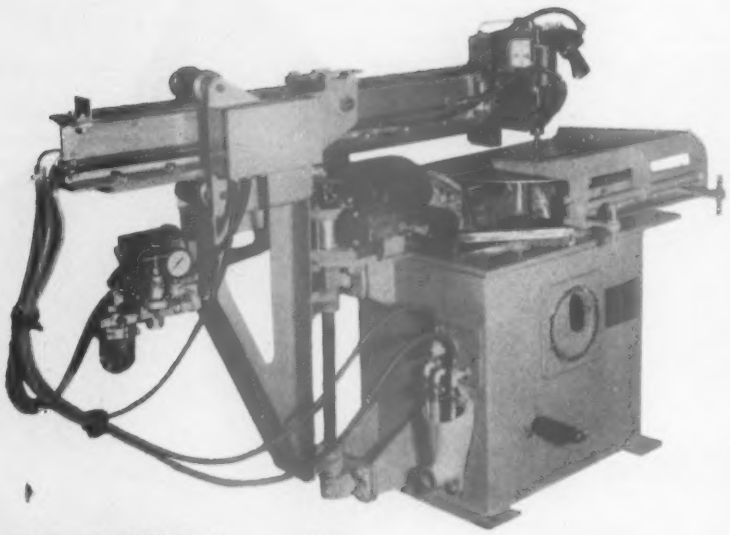


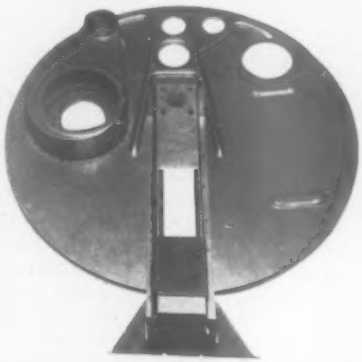
the $7500 welder that saved $25,000 the first year

A machine that increased production enough to effect savings that were double or triple the machine cost during the first year is news to many fabricators not familiar with the versatility of the modern resistance welder. With one man this machine will take the place of four conventional guns and two rocker arm welders requiring a total of six operators. It also eliminates the loss of production due to the unnecessary shifting of the work pieces between operations.

Here is factual proof that special equipment effecting cost saving need not be expensive.

Recent Federal designed and built machines have combined assembly with welding, forming with welding and high speed multiple-shop welding of complete assemblies.

This is part of the reason why—from the start—Federal has always been First In Resistance Welding.



This inner bulkhead assembly for an automatic dryer requires about 50 spot welds. Federal designed a new type expansion gun welder (above) where the gun is supported on the end of a horizontal beam mounted on rollers—moves in all directions—automatically welds as operator squeezes pistol trigger. Manufacturer figures this has saved $25,000 over old method during first year.

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the repair of a ship, however, the work is always done in an existing rigid structure. And since welding is always accompanied by contraction upon cooling, the resultant problems are multiplied. To put it more specifically, if welding is done to repair a deck, the deck itself will be put in tension while the attaching shell and bulkheads will be put in compression. The result can be distortion or even fracture.

Forman discussed in detail the welding sequence that was developed to make a major repair on a cargo ship. The entire bottom of the hull had been damaged, necessitating replacement of the entire bottom shell, 60% of the inner bottom floors and girders and 20 tank top plates. The problem, as he stated it, was to control the normal weld shrinkage and utilize it so that an excessive amount of compression would be kept away from the side shell. To decrease compression in the side shell, a "reverse sequence" was developed. Briefly, the steps were:

(a) All welding was done on the internals and tank top before the shell plating in that area was erected. A cut was made in hold No. 3 across the entire tank top to permit it to contract. The gap of ½ in. that opened up indicates the shrinkage that took place because of welding.

(b) All welding between girth butts was done before the girth welds themselves were made. All longitudinal seams were welded before transverse welds. The seams were first welded to the side shell and flat keel, with the result that the final erection joint was between the C and D strakes. This meant that the longitudinal seams welded under the greatest restraint were removed from the side shell. Also the welding described above was done simultaneously in all sections of the bottom shell. The shrinkage from this mass of welding was distributed throughout the bottom, avoiding a cumulative effect.

(c) The final transverse butt welding progressed simultaneously from amidships fore and aft and from bow and stern towards two expansion joints.

The standard sequence for such a job usually calls for all welding to start amidships and at the centerline. The welding then progresses fore and aft and outboard, attaching the new bottom plating to the side shell last. This sequence develops maximum

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compression in the side shell.

Forman warned against the "hang-overs" that still exist that one welding sequence can be best under any and all circumstances. The flexibility of the shipyard should not be limited by writing a preconceived welding sequence into the contract specifications, he said.

Brazing Titanium

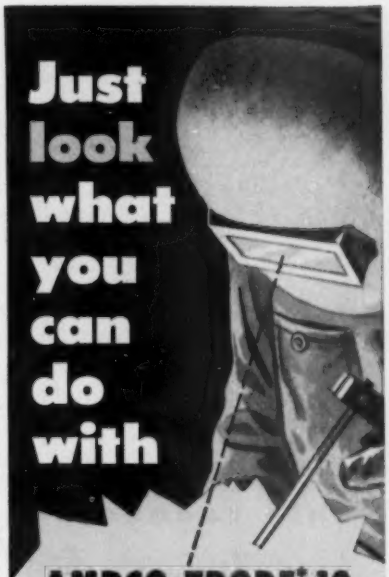
The brazing and soldering of titanium were discussed in two papers: one by H. L. Meredith, Aerophysics Division of North American Aviation Corp., and one jointly authored by J. M. Parks and N. A. DeCecco, of Armour Research Foundation.

The Meredith paper was derived from a search to find a method for sealing the contents of a titanium sphere against atmospheric conditions and chemical attack by lubricating fluids. The most desirable method was considered to be soldering with soft solders. However, there is no known low-melting-point alloy that will bond with titanium sufficiently well to insure a sound joint.

Titanium is very brazable with silver alloys. At brazing temperatures, however, titanium absorbs oxygen, nitrogen and hydrogen, to the detriment of the joint. This could be overcome, it was felt, by inert-gas protection. A quick, localized heating and moderate cooling were other conditions held to be necessary to good brazed joints.

An induction-brazing platform resulted in the successful brazing of specimens for shear tests. A focus inductor work coil surrounds the specimen. Then a bell jar is lowered over the coil and specimen, forming a seal on the base plate of the platform. The chamber is evacuated, and an inert gas is introduced. The gas is allowed to circulate and escape through an outlet orifice. This brazing method permits the brazing to be done without using a flux.

The Parks-DeCecco paper considered methods for brazing commercially pure titanium with an oxyacetylene torch, by resistance heating and in a furnace with an inert-gas atmosphere of commercial purity. Torch-heated single-lap joints were found to have a high shear strength when tested in tension. Joints brazed with fine silver broke with a ductile shear fracture; joints made with other brazing alloys broke with a brittle shear fracture. Resistance-



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heated lap joints had sufficient strength so that the titanium parent metal broke outside the lap area.

An exploratory investigation was made into recrystallization welding (elsewhere discussed). Commercially pure titanium and titanium alloy with 7% manganese were both joined by this method. The joints thus produced had shear strengths equivalent to the shear strength of the annealed titanium alloy.

Other experimental work with titanium was described in a paper by J. C. Barrett and I. R. Lane, Jr., both of the U. S. Bureau of Mines. Arc welds in ⅛-in titanium sheets were made inside a steel chamber, capable of being filled with any atmosphere desired.

Previous work along these lines had shown that adulteration of a helium atmosphere by a volume percentage of oxygen or nitrogen as low as 1% would result in welds of lowered bend ductility compared with specimens welded in pure helium. The present paper reported continuing research, in which the percentages of contaminants in the helium atmosphere are being lowered in an attempt to establish the threshold of damage.

Spot welding of titanium-carbon alloys was discussed in a paper by three authors: E. F. Holt and N. L. McClymonds, of P. R. Mallory and Co., Inc., and F. H. Vandenburgh, of Mallory-Sharon Titanium Corp. This trio conducted an investigation of spot welds in three grades of carbon-titanium sheet — 0.1%, 0.4% and 0.6% carbon — in sheet thicknesses ranging from 0.038 to 0.047 in. Weld shear strength, they found, appeared to be relatively unaffected by carbon content. Ductility was lowered substantially with increasing carbon. Welds of good strength, quality and consistency were obtained over a wide range of conditions. Optimum conditions, however, may be considered as: weld current of 11,000 amp, weld force of 1,350 lb and weld time of 18 cycles.

Aluminum to Other Metals

Resin bonding or cementing, soft and hard soldering, brazing, pressure welding and new arc and flash welding techniques are making it possible to join aluminum to practically any metal, stated Mike A. Miller, of Aluminum Research Laboratories. The method chosen should depend on the design of the parts, permissible temperatures and service requirements. In Mr. Miller's opinion, the procedures available will meet almost every requirement of service and can enable aluminum to be used in applications hitherto unthought of.

For the welding of medium-alloy, high-strength steels, the newest method, according to Howard L. Miller, of Republic Steel Corp., and Arthur E. Wilkoff, of Youngstown Steel Car Co., is to use electrodes of steel made from the same heats as the plates. A much more uniform hardenability and better machinability of the welded structure is obtained when the high-strength steels are welded with electrodes made from the same analysis as the plates. This holds true for both submerged-arc welding and manual arc welding.

The high-strength steels combine yield points of from 90,000-120,000 psi with very high impact properties at temperatures down to —60 F. The Army has found such material useful for gun carriages and in other military applications.

A new method of controlling arc length and new techniques for feeding and controlling wire speed in Mig (metal-inert-gas) welding were disclosed by R. W. Tuthill, of General Electric Co. The new equipment, Tuthill said, will make it feasible to weld aluminum and other metals with wires ranging in diameter from 0.030 to 0.093 in. This product was exhibited at the show and attracted much interest.

Substitute for Columbium

Suitable chromium and titanium additions to 18-8 stainless weld metal will substitute satisfactorily for the usual columbium in providing protection against intergranular attack, asserted Hallock C. Campbell, of Arcos Corp. The titanium was transferred across the arc by adding a calculated amount of aluminum to the electrode coating so that the aluminum was oxidized instead of the titanium.

As a stabilizing element for weld metal, chromium proved more effective than titanium at the low levels studied. When the chromium level was about 22%, corrosion resistance was comparable to that obtained from types 347 and 308L (extra-low-carbon) stainless-steel electrodes. Vanadium was found unsatisfactory as a stabilizing element.

JOINING 1⅛-in. thick phosphorized copper-plate bottom and shell, using ANACONDA Copper-372 Welding Rod and Aircomatic process. Grooves are angled 60° to 90°, root spacing 3/16 in. Welds made with four passes on one side, back chipping and one pass on other side.

UNUSUAL COPPER WELDING JOB—

1⅛-in. thick plates welded at high speeds

THIS was an unusual job for any metal fabricating concern. It involved four chemical process kettles formed from 1⅛-in. phosphorized copper plate into shells 6 ft. in diameter by 3 ft. deep and fitted with reversed-dished bottoms 18 in. deep – the bottoms welded to the shells.

The welding process selected by The Ansonia Copper and Iron Works of Cincinnati, fabricators of the kettles, was the Aircomatic* process using ANACONDA Copper-372* Welding Rod in coil. At the start of each weld, the work was preheated to only 300 F. With a welding current of 400-500 amperes, the 1/16-in. and 3/32-in. welding rod was fed in at speeds up to 396 inches per minute.

The welding of copper plate of this thickness is exceptional. Conventional methods would have required up to 2½ hours per foot of joint, but with ANACONDA Copper-372 Welding Rod and the Aircomatic process these joints required only 13 minutes per foot.

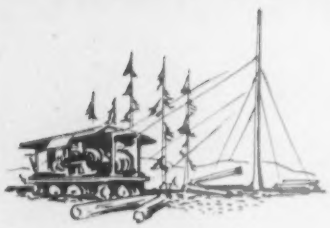
Whatever type of welding business you are engaged in—fabricating, production or repair – there's a correct ANACONDA Copper or Copper Alloy Welding Rod for nearly every job. They are available from distributors throughout the United States. Publication B-13 tells about them. For your copy, write to *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.*

*U. S. Patent No. 2,220,464 53159

HERE'S THE FINISHED WELD. ANACONDA Copper-372 Welding Rod was used because welds develop full strength of annealed base metal without costly hammering.

braze or weld with confidence*—ANACONDA® *welding rods

WEYERHAEUSER finds many applications for the ARCAIR TORCH



Weyerhaeuser Timber Company, at their White River operation near Enumclaw, Wash., finds many time and money saving uses for their ARCAIR torch.

Removing flanges from cast iron railroad wheels is an unusual application but it shows the versatility of the ARCAIR torch and its ability to cut the hardest metals.

In converting these railroad wheels to undercarriages for heavy logging equipment the ARCAIR torch was found superior to any other cutting method in speed, ease of operation, economy and smoothness of cut surface.

Regular jobs for ARCAIR at Weyerhaeuser are gouging iron and stainless steel castings, repairing shovel buckets, cutting all metals, removing welds, scarfing and preparing for welding or brazing. "Couldn't do without it now," says the machine shop foreman.

The new ARCAIR method slashes operating costs too, using only compressed air and an electric arc, and solves many metal removing problems for fabricators, foundries, maintenance shops and machine shops throughout the country.

Write for free bulletin with facts and photographs of other time and money saving applications of the Arcair Torch.

There is an authorized Arcair dealer near you who will arrange for a demonstration in your plant. Arcair Company, *Eastern Division:* 423 S. Mt. Pleasant St., Lancaster, Ohio. *Western Division:* P. O. Box 4107, Bremerton, Wash.

Arcair TORCH

Cuts all metals—using only electric arc and compressed air

Dr. Campbell is to be complimented on the giant charts with multi-colored curves which accompanied his talk. This is showmanship of a level that is seldom found in technical presentations.

An inert-gas method for welding stainless-steel piping for food and chemical plants was discussed by F. J. Pilia, of Linde Air Products Co. The method may be applied to piping of diameters ranging from ¼ to 4 in., and the controllable technique allows the operator (or welding inspector) to determine the extent of penetration and contour of the penetration bead during the welding of the first pass. A sharp point on the surface of the weld puddle indicates penetration; a notch shows lack of penetration.

No filler metal is applied on the first pass, which is made merely to fuse the edges together. Filler metal is added, however, for the second or cover pass. An argon back-up inside the pipe will give better weld results.

The arc welding of ferritic and austenitic nodular cast iron was investigated by Harry Fisk, Willard Boam and Jesse Sohn, all of Curtiss-Wright Corp., with a view of applying this material to parts of jet engines. A high-strength, ductile fillet weld was required between the austenitic nodular cast iron and 18-8 stainless sheet. A martensitic stainless electrode comparable in composition to AISI 431 was found to do the best job. On the ferritic nodular cast iron, two electrodes—AISI 310 and E-7016 — produced satisfactory welds, the former being slightly superior.

Welding Ductile Iron

The fusion welding of spheroidal graphite cast iron (better known as ductile iron) was covered in a paper by T. E. Kihlgren and H. C. Waugh, both of International Nickel Co., Inc. The emphasis was on metal-arc welding with nickel-iron electrodes. The authors also discussed the applicability of ferritic electrodes and provided some data on oxyacetylene and inert-gas welding methods, using both ductile-iron and nickel-alloy filler rods.

George L. C. Dehn, of the Magnaflux Corp., Dallas, Tex., discussed the inspection techniques on a recently completed pipeline for crude oil. The use of quality-control methods, including magnetic-particle inspection,

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All-State No. 13 Nickel-Silver Build-up Rod (and the No. 11 Brazaloy Flux that's always used with it) is sold just about everywhere. Over 600 All-State Distributors have it in stock. Write us for names of those near enough to you to be convenient. Ask for "Steel Booklet" to get complete application instructions.

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White Plains, N. Y.

reduced the number of welds containing detrimental defects by 84% after handling methods and welding procedures had been corrected.

Altogether, 31 technical papers were given, besides the all-day symposium on resistance welding. It's to be regretted that the space available limits our report to a mere sampling of this rich mine of welding information. Our apologies to the authors we neglected; we're very sorry, but somebody had to be left out.

To sum up this Houston meeting, it was a grand affair and we enjoyed every minute of it. The welding grapevine has it that another all-welding show and spring technical meeting is to be held next May in Buffalo. But we'll all remember Houston for a long, long time.

WHAT'S IN AN ELECTRODE

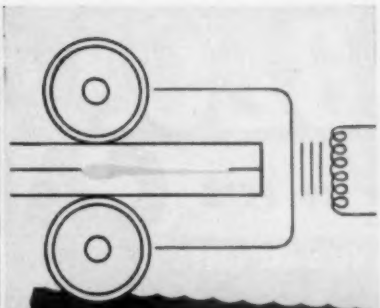
(Continued from page 30)

as nickel, molybdenum, chromium, vanadium and copper may also be introduced into the deposit from the coating. These elements, however, are used solely for alloying purposes, to impart specific properties to the weld deposit, and not as deoxidizers.

Job 5—Slag Forming

With the exception of nickel, molybdenum and copper, the metals introduced in the coating are oxidized to some extent, and the resultant oxides enter the slag. This is particularly true of manganese and silicon because of their low transfer efficiency. Oxides of these elements have a pronounced effect upon slag characteristics. Manganese oxide is strongly basic while the oxide of silicon is strongly acid. Thus a small change in the content of either ferro-manganese or ferro-silicon is capable of markedly altering the nature of the slag.

The film of slag that covers the deposit after welding is not merely an unavoidable residue like the tailings from an ore smelter. It is deliberately planned and provided. The duties of the slag are: (1) to supplement the shielding gases and give additional protection against atmospheric contamination, (2) to flux refractory oxides in the deposit and (3) to retard solidification of the liquid metal sufficiently to allow for the escape of gases and the liberation of non-metallic inclusions. The slag also serves to con-



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You can order Ampco Weld wheels as rough forgings, finished blanks, or fully machined, as you prefer.

Ampco Weld wheels are part of an extensive line of Ampco resistance-welding products. All meet or exceed RWMA specifications. And Ampco offers you free, expert engineering service for specialized applications, if you want it. Order Ampco Weld wheels today — watch production step up, costs step down.

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Cored and heavily copper coated for twin arc torches.

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The "right" brush for every type and make of welding equipment.

ELECTRODES and RODS

All standard types and sizes.

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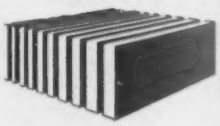

1/4" thickness and up.

PASTE

Heat resistant, easily molded.

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trol contour, uniformity and general appearance of the weld. With all of these functions in mind, the composition of the coating must be carefully balanced to yield a desirable slag.

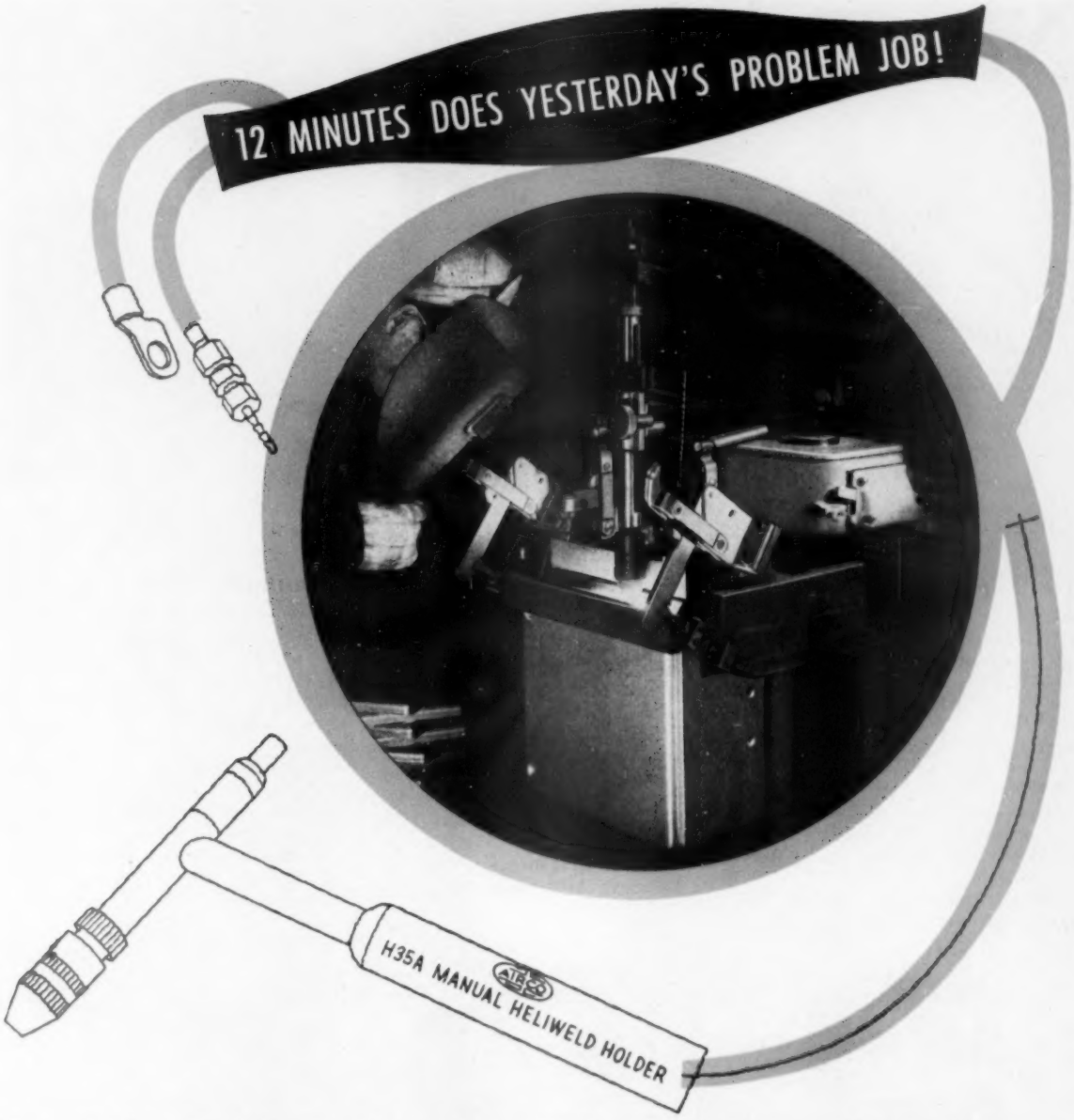
Slags are complex silicates or titanates, depending upon the type of electrode. Some types of slag are influenced to an appreciable extent by the composition, quality and surface condition of the base metal. In cases of this kind, penetration of the arc becomes of major importance as the greater the penetration, the greater the amount of base metal that is brought into play to alter the action of the slag.

Many elements in the slag result from decomposition or reaction of coating materials that are incorporated in the coating for other purposes than slag formers. Soluble silicates are used primarily to bind the ingredients of which the coating is composed and control the rate of decomposition of organic shielding materials. They also serve to stabilize the arc and provide desirable slag-forming materials. Carbonates and hydrates are used, as we have seen, as sources of shielding gases or to control gas-shielding reactions, but they also contribute to slag formation. Deoxidizers also influence the mobility of the slag, and the oxidized portion of the deposit enters the slag. Similarly, arc stabilizers serve additionally as fluxing agents and ultimately become a part of the slag.

It is frequently necessary to supplement the slag by additional materials whose primary purpose is that of providing sufficient bulk. Such materials must be selected with due regard to their effect on arc action, arc energy, crucible formation, oxidation-deoxidation ratio and slag characteristics. The materials used as slag formers are usually confined to oxides and silicates.

NEXT MONTH: *Mr. Mathias will discuss the problems of physical formulation of electrode ingredients and of transferring the coating formula from the laboratory to the production line. Among variables that must be considered are: time, temperature control, sequence of additions, homogeneity, consistency for high-speed extrusion, flow characteristics as related to concentricity of coating. There are also problems of handling at high speed and drying to develop the specified characteristics.*

12 MINUTES DOES YESTERDAY'S PROBLEM JOB!



They couldn't have done it this way a few years back. That box is made of 1/16″ 52S aluminum — a problem alloy to weld. Today, with Airco Machine Heliwelding, Suckle Electronics Company, Camden, N. J., turns out one of these case boxes every twelve minutes. The four 15″ seams that join the bottom pan to the sides take about 45 seconds each, as the Machine Heliweld Holder moves smoothly over them, carried by an Airco No. 20 Radiagraph. Heliwelding provides pin-point heat concentration for joining hard-to-weld metals . . . with a minimum of finish grinding.

For full information on Heliwelding, get in touch with your nearest Airco office.

When you need oxygen, acetylene, nitrogen, or other industrial or rare gases, think of Air Reduction. A nationwide distribution system is ready to supply your needs.

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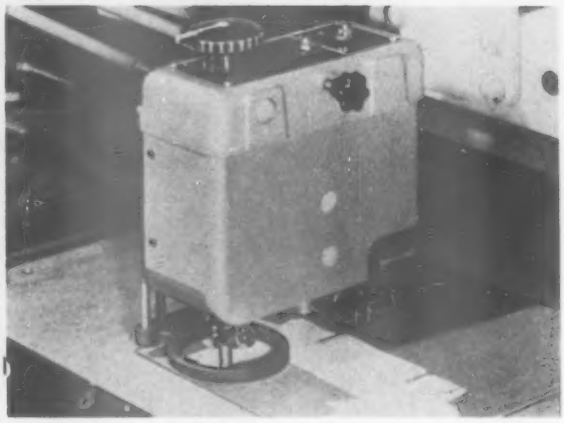
New Products . . .

GAS ENGINE drive is featured on a new Strand flexible shaft machine. Machine can be bench-mounted also



PLASTIC templets, cut out with scissors, guide the new tracer for the automatic Linde flame-cutting machine

Gas Powered Grinder

A NEW flexible shaft grinder is powered by a 5 hp gasoline engine mounted on a wheelbarrow truck. The 7-ft flexible shaft is attached directly to the motor shaft. Designated Model DGX-7, the new flexible shaft grinder was designed for use where no compressed air or electric power is readily available.

The engine is mounted on a swivel base that moves 180 deg. If need be, the unit can be mounted as a fixed bench tool.

N. A. STRAND DIV., Franklin Balmar Corp., Woodberry, Baltimore 11.

* * *

Rectifier Welder

A D-C rectifier type welder has been added to the NCG line of Sureweld welders. Current characteristics are said to be unusually good; short circuit current is high, giving sufficient drive to the arc without any accessories.

A three-phase transformer supplies the a-c power to a full wave selenium oxide type rectifier which changes it to d-c. Cooling air, directed by baffles, is drawn in two separate paths through the rectifier stack and the transformer by a powerful fan. This keeps heat on all windings well below the 90-deg C rise permissible for Class B insulating materials. The cabinet is flush-front in design with recessed control panel. Quick-disconnect plugs on the welding leads are protected with fibre sleeving. The welder comes in 100, 200, 300, 400 and 600 amp models.

NATIONAL CYLINDER GAS CO., 840 N. Michigan Ave., Chicago 11.

* * *

Long-Life Cover Plate

A NEW Sellstrom plastic welding cover plate is said to provide about 1,500 hours of service under average conditions. This is 125 times as many hours as expected from the glass cover plates, says the company. The "Long Life" cover plate is not affected by acetone, benzene, gasoline, high octane fuels or high heat and is also resistant to bending, pitting and breaking. Designated PKU in the catalog it is standard size, 2 by 4 3/16 in. There is also a "Long Life" cover lens in the 50 mm size for welding goggles.

SELLSTROM MFG. CO., 615 N. Aberdeen St., Chicago 22.

Automatic Tracer

A NEW automatic tracer for flame-cutting machines utilizes an inexpensive plastic pattern that may be cut to shape with scissors or knife. There's no need to allow for kerf when preparing the templet. Compensation for kerf width up to ¼ in. is accomplished automatically by presetting a dial on the new tracer. Tracing speed varies between 2 and 30 ipm and can be varied if need be while the machine is operating.

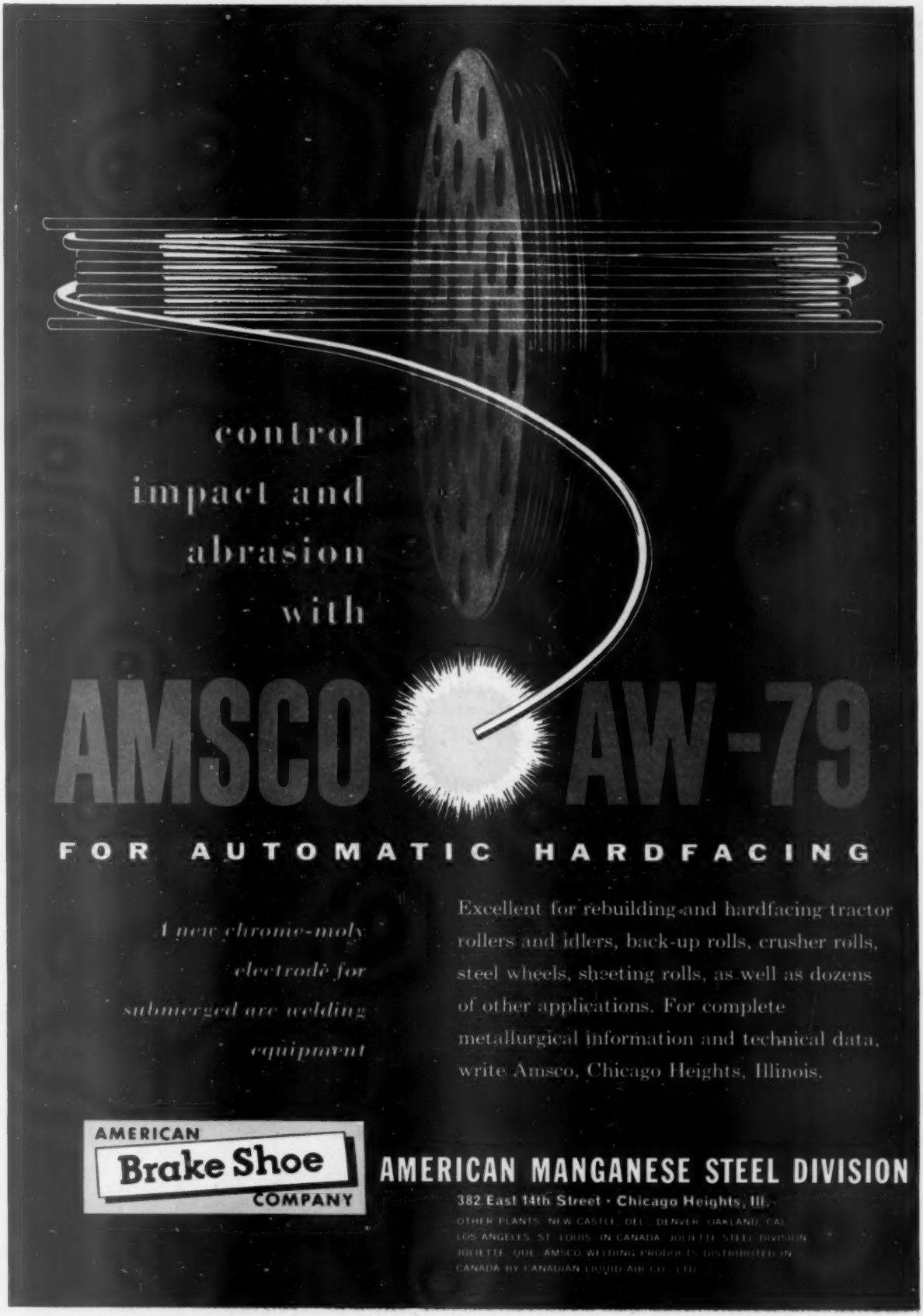
LINDE AIR PRODUCTS CO., 30 East 42nd St., New York City 17.

* * *

D-C Rectifier Welder

A NEW rectifier welder in 200, 300 and 400 amp ratings is now available from M & T. It is a heavy-duty machine designed for production welding. Ventilation is fan-forced, up-draft for long rectifier life and cool operating temperatures.

METAL & THERMIT CORP., 100 E. 42nd St., New York City 17.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Excellent for rebuilding and hardfacing tractor rollers and idlers, back-up rolls, crusher rolls, steel wheels, sheeting rolls, as well as dozens of other applications. For complete metallurgical information and technical data, write Amsco, Chicago Heights, Illinois.
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JOLIETTE, QUE. · AMSCO WELDING PRODUCTS DISTRIBUTED IN
CANADA BY CANADIAN LIQUID AIR CO., LTD.

Welding Hose Reel

A HANDY housing for double welding hose is called the "Weldreel". It stores 50 ft of the double hose and supplies it with a slight pull. It requires 26 by 30 in. of space and can be hung from the ceiling, mounted on the wall or attached to the floor.

UNITED SPECIALTY CORP., P. O. Box 698, El Dorado, Ark.

* * *

A-C Welder

A NEW 50% duty cycle welder has an unusually wide range of current adjustment. A moving coil transformer type, Model 99 has a rated output of 250 amp at 30 arc volts with a top usable output of 350 amp. It has two open circuit voltages, on different ranges, to make it flexible and to utilize low-hydrogen electrodes. It can be operated from either 220 or 440 volt single-phase lines.

MILLER ELECTRIC MFG. CO., Appleton, Wis.

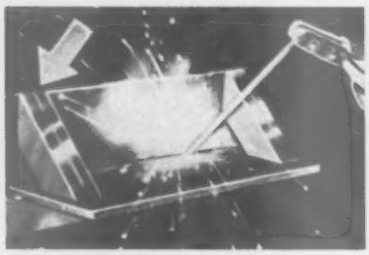
* * *

Electrical Solder Flux

SPECIALLY designed for electronic connections, a new series of HR alloy paste solders are for work covered by Federal specifications MIL-S-6872, AN-S-62 and MIL-E-5400. Metals contained in the alloy paste solders conform to Federal specification QQ-S-571-b. An activated high-rosin flux in the HR series prevents corrosion, it is claimed. Temperature ranges available extend from 220 to 650 F.

FUSION ENGINEERING, 4504 Superior Ave., Cleveland 3.

* * *



Magnetic Welding Clamps

NEW Aronson magnetic welding clamps are used to locate and hold metal workpieces for tacking and welding. Three models are available: the MCP with a 45-deg bevel, the MCV for holding rounds to rounds or flats and the MCA, adjustable to any angle. Magnet cores are made of "Alcomax" and are said to retain their power indefinitely. A Model MCR 4-in. magnet will hold 275 lb with an air gap of 0.005 in. The Model MCQ cube magnet will hold 375 lb with the same air gap. Both the latter magnets have a hand thrust screw for lifting the clamp from the workpiece after use.

ARONSON MACHINE CO., Arcade, N.Y.

* * *

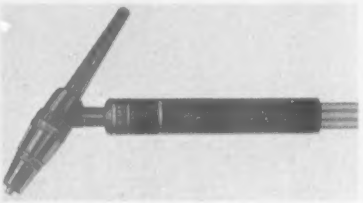
Spot Welding Control

A NEW synchronous precision control for top quality spot and seam welding of stainless, aluminum, magnesium and nonferrous parts has been announced by G-E. It can be used on motor, fluid or air-operated machines. Basic components are an ignitron contactor, a weld timer and phase-shift heat control, and a sequence timer (if required).

Special features include surge resistors to increase firing-tube life, one-piece silver-plated copper bus bars and positioning of the terminal boards at an angle on the side of the panel for easy access. Ratings are 180-280/410-510 volts, 60 cycles.

GENERAL ELECTRIC CO., Schenectady 5, N.Y.

* * *



500 Amp Torch

CONTINUOUS heavy-duty tungsten-inert-gas welding at 500 amp is possible with the new water-cooled HW-12 torch. Any type of current or polarity can be used with the torch to weld nearly all commercial metals and for hard-facing operations. All external plumbing has been eliminated to prevent chance of breakage. Quick-release collets are a new feature permitting rapid replacement of the tungstens. Two torch caps are available for 3 or 7-in. electrodes.

LINDE AIR PRODUCTS CO., 30 E. 42nd St., New York City 17.

* * *

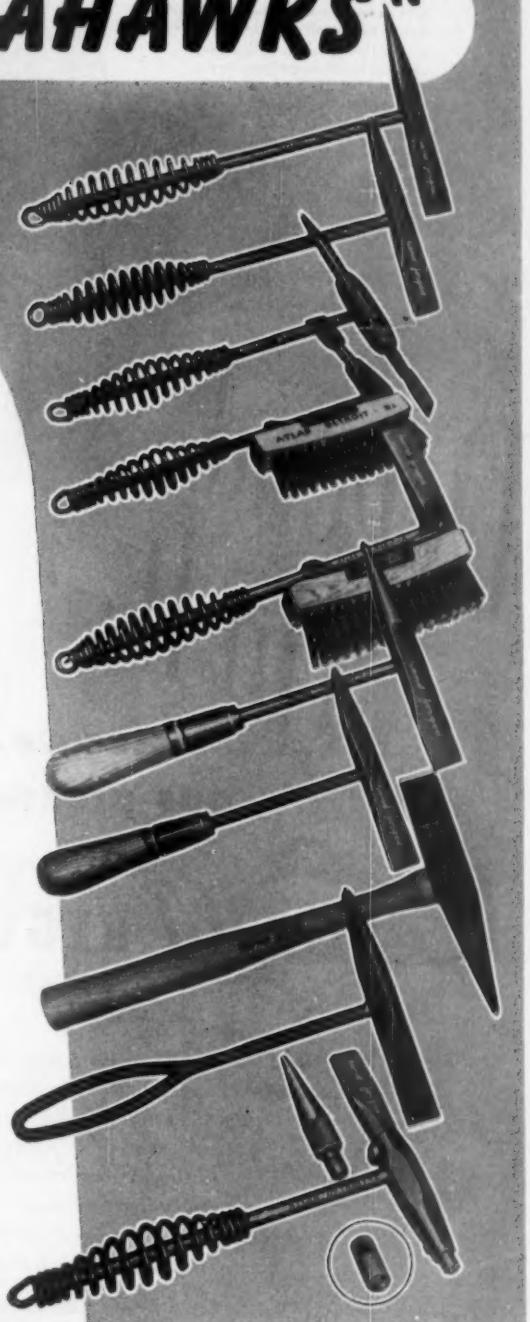
Toggle Clamps

FIVE features mark the new Caddy toggle clamps for holding workpieces while tacking or welding. A newly designed linkage is said to provide double the pressure of other clamps with the same force on the handle. The pivot pins are said to have three times more bearing surface than other clamps. Also notable is the clamp's all welded construction, heavier links and handle and reinforced clamp bar. The three basic models, V-1, V-2 and V-3 have 1,000, 2,000 and 3,000 lb pressure ratings, respectively.

ERICO PRODUCTS, INC., 2070 E. 61st Pl., Cleveland 3.

"ATLAS TOMAHAWKS"

WH-20
WEIGHT 14 ozs.
LENGTH 11"



Featured above is one of 3 new WH Models, each with a different head style. Like all Atlas Tomahawks WH-20 is tough, has balance and endurance. For those who prefer wood handle tools, there's nothing better. Ask your Dealer for Form WCF32A describing all 28 models of Atlas Tomahawks.

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Atlas WELDING ACCESSORIES CO.

707 E. LEWISTON AVENUE, FERNDALE 20 (DETROIT) MICH.

R-99 Series Two Stage Dualized Regulator
One of six models and 26 types available.
This two stage regulator provides absolute uniformity of pressure.

Depend On It...

accurate, even gas pressure

with Gasweld REGULATORS

"Gasweld" Regulators always deliver even, accurate gas pressure on every welding and cutting job. Liquid's 60 years of experience in manufacturing pressure reducing regulators assures you of units designed to take and hold the finest adjustment—engineered for longer life and trouble-free operation. Available for use with oxygen, acetylene, hydrogen and petroleum fuel gases.

Liquid also produces Oxygen, Acetylene and other commercial gases including CO_2 in all its forms—Gas, Liquid or Solid (dry ice) for industrial use.

Liquid

Several desirable territories are still open for Jobbers and Distributors of Liquid Red Diamond Arc Welding Equipment. Write for full information.

Get the facts on Liquid's new line of Arc Welding Equipment. Write for Catalog.

THE LIQUID CARBONIC CORPORATION
3100 South Kedzie Ave., Chicago 23, Illinois

3-D Flame-Cutting

NEW, semiautomatic "3-D" flame-cutting equipment was designed to scarf the edges of curved metal shapes prior to welded assembly, such as in tank hulls and pressure vessels. The cutting flame slants at a constant angle from the desired apex of a scarfed edge. A system of twin rails with four spring-loaded drive rollers and an idler keep the torch in proper cutting position. Cutting speeds range up to 15 ipm.

The rails on which the cutting machine rides can be built in a complete circuit, or in any part of a circuit, to guide the torch up, down and around. Sets of rails and the accompanying fixture must be built for the specific job being planned, says the company.

MILWAUKEE SHIPBUILDING CORP., 3718 W. Lancaster Ave., Milwaukee 9.

* * *

Hardfacing Electrode

DESIGNED for build-up work and hardfacing applications where the deposited metal can be machined or flame hardened, the G-E type W-98 electrode comes in $\frac{1}{8}$ to $\frac{1}{4}$ in. sizes. It can be used on a-c or d-c and yields a deposit having a 250 Brinell hardness that flame hardens to about 350 Brinell. Uses recommended are on road machinery parts, pinion teeth, pump housings, shafts, sprockets, ship hawse pipe, etc.

GENERAL ELECTRIC CO., Schenectady 5, N.Y.

* * *

New Contour Marker

AN improved Contour Marker permits complete marking of the average pipe joint in less than 5 minutes. An articulated arm with soapstone point and a dial marked in both degrees and pitch are mounted on a base which is curved to rest on the pipe. When the dial is set to the desired angle, the jointed arm traces the cutting line around the pipe. The standard model marks pipe between $1\frac{1}{2}$ and 18-in. OD, the "Jumbo" model from 16 to 48-in. OD.

CONTOUR MARKER CORP., 1843 E. Compton Blvd., Compton, Calif.

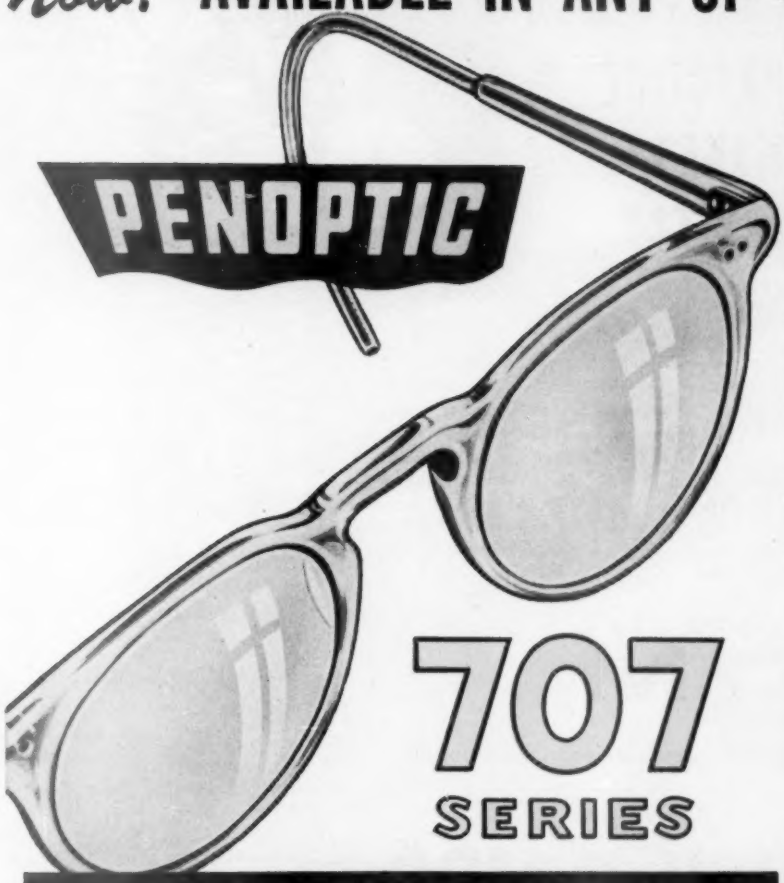
* * *

Electrical Valve

FOR accurate, dependable remote control of air-operated, mechanical devices, the Sciaky 4-way "Electro Valve" can maintain a speed of 500 strokes per minute. It can be used for all types of machinery using single or double acting, pneumatic power cylinders. It works on any 110, 220 or 440 volt, 60-cycle power supply.

SCIAKY BROS., INC., 4915 W. 67th St., Chicago 38.

Now! AVAILABLE IN ANY OF 4 MODELS!



PLASTIC FRAME SPECTACLE TYPE SAFETY GOGGLES

Direct From the Manufacturer

The Penoptic "707 Series" goggles assures workers of dependable protection, comfort and a distinctly personal appearance. All models are of tough, lightweight, non-inflammable plastic. High line style, drop-eye shape and flesh color combine to satisfy workers' demand for a more personal look. This new series offers a choice of:

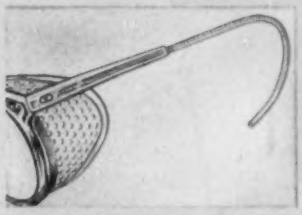
- Spatula or cable type temples . . .
- Adjustable rocker or regular nose pads . . .
- And contour-fitted side shields . . .

These models in a full range of bridge widths and lens sizes make possible combinations adaptable to many different operations throughout industry. Penoptic's manufacturer-to-you distribution policy now offers new opportunities to save with safety.

For descriptive literature and prices write directly to . . .

MODEL 707

Wire core temples with cable wound ends.



MODEL 707S

Plastic side shields, wire core temples.

MODEL 707P

Spatula temples, wire reinforced.

MODEL 707R

Rocker-type nose pads supported by adjustable metal arms.

PENNSYLVANIA OPTICAL COMPANY

READING, PENNSYLVANIA

Known for Fine Ophthalmic Products Since 1886

this PRACTICE MAKES for PERFECT welds

Make it a practice to use Protect-O-Metal before welding—and get easy-to-clean, tough, more perfect welds everytime! P.O.M. cuts out spatter adhesion, improves fluxing, stabilizes the welding arc, saves 85% of weld cleaning time and labor—all for about 1/10c per foot of weld. P.O.M. No. 2, water soluble, goes on fast and welding can start AT ONCE. No fumes, no trouble. P.O.M. No. 8 dries hard in less than an hour, protects from rust and corrosion for months, and is a good paint primer. Spatter wipes off either in a flash! With P.O.M. and a little practice even amateurs can make more perfect welds. Order a trial gallon today.

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G. W. SMITH & SONS, INC. 5408 KEMP ROAD, DAYTON, O.

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Series (Two Stage) Regulators

Illustrated: Model 1101 Two Stage Oxygen Regulator

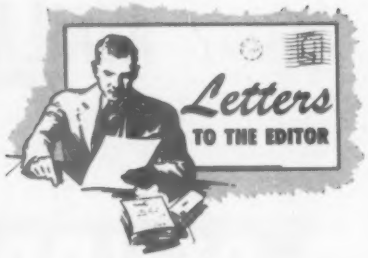
- Working pressure remains constant
- Anodized forged aluminum bodies and bonnets
- 4000 lb. HP gauges
- Smooth flow, large capacity

Designed for today's higher cylinder pressures. Light, compact — accurate pressure control. Simple, rugged—few parts, all readily accessible. *Also new:* K-G 1200 Series Single Stage Regulators. See your K-G Distributor or write to

The K-G Equipment Company (Inc.)

A Unit of Air Products, Inc.

Dept. A, Box 538, Allentown, Pa.



They Liked June Editorial

Dear Sir:

I always read your editorials. I was particularly impressed, however, by your "Remember Houston." To me, this editorial represents progressive, projected thinking.

Some day when NWSA grows a little stronger and becomes more seasoned, perhaps, your ideas set forth in "Remember Houston" will become reality. Warmest personal regards.

Cordially yours,
William A. Rice, President,
National Welding Supply Assoc.
Charleston, W. Va.

We're Glad We Helped

Dear Sir:

Thank you very much for sending the June issue of THE WELDING ENGINEER. The Houston Story was very well done.

The success of the convention speaks very well for the value of good publicity such as this.

Cordially yours,
Gene Robbins, Publicity Director,
Chamber of Commerce
Houston, Texas

Dear Sir:

Cheers to you for your "Remember Houston!" editorial in the June issue. It's a honey. You certainly didn't pull any punches. I, for one, am glad that you had guts enough to make the recommendations and predictions which you did regarding the Houston Show.

Cordially yours,
Roy W. Poe, Sales Manager,
Tweco Products Co.
Wichita, Kansas

That May Editorial

Dear Sir:

We all liked your May editorial so well that we want to send copies of it to all our sales personnel.

May we have your permission to reprint it?

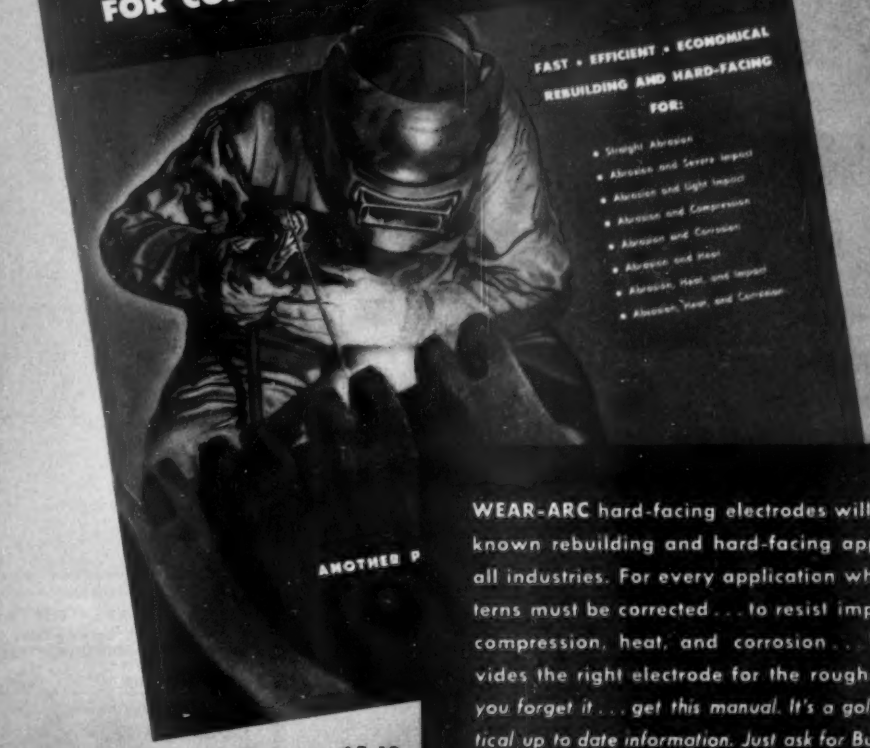
Sincerely yours,
Loren G. Stevens, Advt. Mgr.
National Cylinder Gas Co.

YOU NEED

...TO SALVAGE AND REBUILD WORN EQUIPMENT PARTS. THIS NEW PRACTICAL CATALOG TELLS YOU HOW...

WEAR-ARC

HARD-FACING ELECTRODES FOR CORRECTION OF WEAR PATTERNS



AR-19

WEAR-ARC hard-facing electrodes will handle every known rebuilding and hard-facing application . . . in all industries. For every application where wear patterns must be corrected . . . to resist impact, abrasion, compression, heat, and corrosion . . . *Wear-Arc* provides the right electrode for the roughest job. *Before you forget it . . . get this manual. It's a gold mine of practical up to date information. Just ask for Bulletin AR53-20.*

ALLOY RODS COMPANY

YORK, PENNSYLVANIA

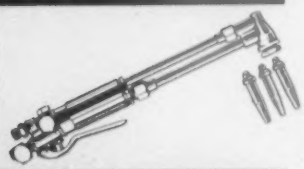
NO FINER ELECTRODES MADE . . . ANYWHERE

Alloy Rods Co.

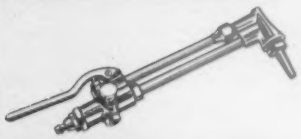
Dockson Torches

for Oxy-Acetylene

WELDING



and CUTTING



and CUTTING ATTACHMENTS

are Built for Better Service

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LETTERS —— continued

Dear Sir:

I have just read your editorial appearing in the May, 1953, issue of THE WELDING ENGINEER. Congratulations!

This is the type of thing I believe we must all be cognizant of and realize that before long we will be back into the buyer's market. Real selling effort must begin sometime and the present is not too soon.

D. R. Warner, Sales Manager,
Miller Electric Mfg. Co.
Appleton, Wis.

Safety—Whose Responsibility?

Dear Sir:

Many thanks for printing my safety piece originally titled "The Explosion That Might Have Been" and re-titled "How Accidents Are Born" during editorial modification (page 53, June, 1953 THE WELDING ENGINEER).

By and large, it's a good job of editorial preparation and I am pleased with your dressed-up version. I like that photo you illustrated it with; that's just what it looked like on the job I wrote about, except that my drum became full of holes from repeated shorts.

I take one exception. Namely, where the article says: "It was also the weldor's fault for not reporting the situation and insisting that his foreman do something about it." It's permissible for this statement to be included, even though I didn't make it, so as to make the reader aware of his obligation and responsibility in calling a hazardous situation to the attention of his foreman.

But in my particular case the foreman *was* told about this. He knew I needed "some place to lay the rod down on" because I requested it, and he should have known it anyway because he could see the need with his own eyes. He was on the job all day, day after day, week after week, watching me arc weld and laying the holder aside *somewhere* after each piece 700 times a day. "Insist" that the foreman do something about it? How shall the mere workman "insist"? By threatening to quit the job? Should I have twisted his arm?

No, it's not that the foreman and the company don't know these things. It's simply that the company has a poor policy toward them.

While the workers collectively are not guiltless, the main fault and responsibility lies with management, both for not doing its job quickly and well enough and for not insisting that workers do theirs. If my job had been properly engineered in the

Low Temperature BRAZING will help you cut your metal JOINING COSTS

BRAZED AND SO TOUGH YOU CAN

BEND IT
TWIST IT
STAMP IT
DRAW IT
HAMMER IT
and it won't break or leak under pressure

Dependable United WIRE BRAZING ALLOYS

for economy and better brazing

For the STEELS IRONS NICKELS
SIL-BOND
Ag Silver Alloy . . . an all-purpose general purpose. Melts 1300°F brazes 1340°F. Use with Sil-FLUX. Tensile 70,000 p.s.i.

For the BRONZES BRASSES
PHOSON
Ag Silver . . . low cost . . . stronger than metals brazed. Melts 1185°F brazes 1260°F. Use with SIL-FLUX. Tensile 95,000 p.s.i.

For the COPPERS
PHOSCO
No Silver . . . Very low cost . . . stronger than metals brazed. Melts 1308°F brazes 1495°F. Self-fluxing. Tensile 85,000 p.s.i.

For complete information ask your WELDING SUPPLY DISTRIBUTOR or our nearest office

OUR BULLETIN No. B-29-4 TELLS YOU HOW TO BRAZE THREADLESS FITTINGS TO TUBING

Ask for your FREE COPY

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SALES OFFICES
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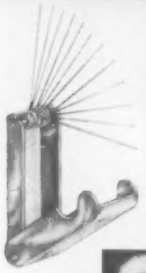
Welding Engineers prefer
THERMO spiral tip cleaner design...

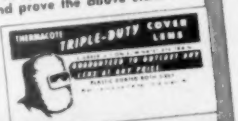


So do welders because they know how the spiral design of Thermo Tip Cleaners removes carbon and slag without scratching or enlarging. Buy Thermo Spiral Tip Cleaners in handy metal case. 12 sizes.

Precision manufactured and guaranteed unbreakable or replaced free.

SAVE 95.5%
ON COVER LENS COST
Send for free sample of the Triple Duty Cover Lens and prove the above claim.

At all Welding Supply Dealers



THERMACOTE CO.
NEWARK • CHICAGO • LOS ANGELES

W-AL-CO RODS
for Welding of
ALUMINUM

ELECTRIC AND GAS WELDING

Drawn Wire
TYPES 25, 43 and 52
Brazing 718

Aluminum Solder

White Metal

WELDING ALLOYS
MANUFACTURING CO.
744 Broad St., Newark 2, N. J.

LETTERS —— continued

first place, a proper location for the holder would have been included in the layout of job facilities and equipment.

And now I better sign off and let you go back to work.

Sincerely,
An Arc Weldor

Our Foreign Friends

Dear Sir:

Thank you very much for sending us a clipping from your publication, regarding our new type of insulated electrode holder. THE WELDING ENGINEER is widely known in Norway.

Yours very truly,
H. Laukvik, Sveisemester,
Oslo, Norway

Dear Sir:

We have read with interest the article "Braze Welding on Big Repair Jobs" in your publication of April, 1953.

Could you allow us to translate and reprint this article in the "Loosco Lascourant," our monthly welding magazine with an issue of 6,000 copies?

Yours truly,
F. Loos, director,
G. L. Loos & Co. Fabrieken N. V.
Amsterdam, The Netherlands

Electrode Comparator Published by British

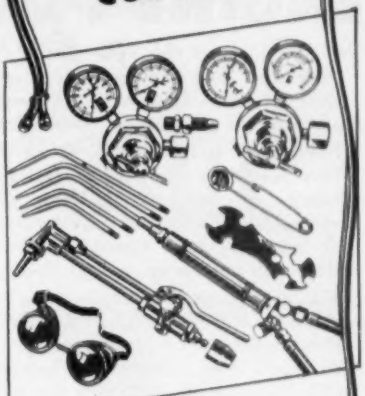
A SLIDE-rule type of comparison chart for mild steel electrodes has been issued by the British Welding Research Association. It enables weldors, designers and others to obtain the basic characteristics of each British electrode type such as coating, position, current and voltage together with the nearest American equivalent. On the reverse side of the rule are shown particular electrodes and manufacturer's names. The comparators are available at 5/-(70c) each from the BWRA, 29 Park Crescent, London, W. I., England.

* * *

Aronson Movie Show Positioner Economies

TIME and money-saving ways to use welding positioners are dramatically presented in a new movie made by Aronson Machine Co., Arcade, N. Y. The Aronson "universal balanced" type of positioner is compared with other makes and with manual chain falls, electric chain falls, and manual positioning. For showings, you may contact the Aronson home office.

FOR
OXY-ACETYLENE
WELDING and
CUTTING



DOCKSON'S
№ 145 OUTFIT

fitted for a complete range of all-purpose welding and cutting operations as heavy as 5" steel.

No. 145 OUTFIT includes:

1—No. 4-E-C Hi-Speed Welding Torch.
1—En. Nos. 2, 4, 6, 8 and 10 "E" Style Elbow Tips.
1—C-4 Hi-Speed Cutting Attachment.
1—C-2 Cutting Tip.
1—No. 134-BE Oxygen Regulator, 200 lb. and 3000 lb. gauges.
1—No. 134-AD Acetylene Regulator, 60 lb. and 500 lb. gauges.
1—Commercial to P. O. L. Adaptor.
1—12½ ft. length ¼" Siamese Hose.
4—Hose Connections.
1—Outfit Wrench.
1—Round File Gas Lighter.
1—Pr. Series 66-19-6 Welding Goggles.

THERE IS A DOCKSON DISTRIBUTOR NEAR YOU — Let us send you his name and our catalog of Welding and Cutting Equipment, a complete line "BUILT FOR BETTER SERVICE".

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WISCONSIN

The Name that Stands for

HEAVY-DUTY Air-Cooled ENGINE POWER

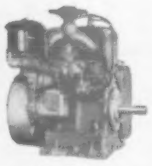
at its Best!

More than 500 manufacturers of engine-powered machines of all kinds, utilizing power within a 3 to 36 horsepower range, specify WISCONSIN Heavy-Duty Air-Cooled Engines as "original equipment" on their machines.

They base their selections of engines on such factors as heavy-duty construction, low-cost operation and maintenance, Air-Cooling that provides trouble-free service in all locations, easy starting, and readily available replacement parts when needed, through a reliable source.

Wisconsin Motor Corporation is the world's largest manufacturer of Heavy-Duty Air-Cooled Engines, from 3 to 36 horsepower, in 4-cycle single cylinder, 2- and 4-cylinder types. Here is dependable power to *fit the machine* and *fit the work* for which the machine is designed.

4-cycle single cylinder 3 to 9 hp.



2-cylinder 7 to 14½ hp.

V-type 4-cylinder 15 to 36 hp.

WISCONSIN MOTOR CORPORATION

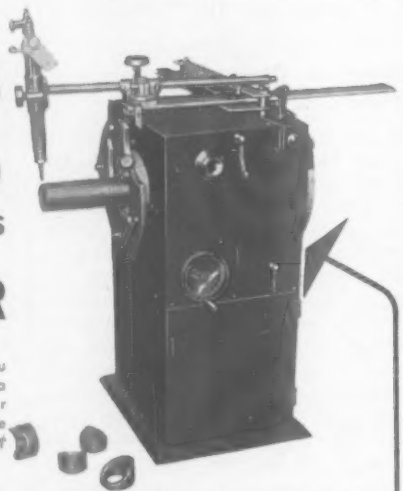
World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 46, WISCONSIN

A 7516-½-A

A Woerner TUBULAR PROFILE CUTTER

SAVED $9,000.00 ON PIPE-CUTTING COSTS IN ONE YEAR



You'll be amazed at the time and money you save when you cut pipe or tube with a Woerner Tubular Profile Cutter. One user reports over 90,000 cuts in the past twelve months..."easily an average saving of 10¢ a cut on material and operating time."

WOERNER TUBULAR PROFILE CUTTER

All types of precision flame cuts on pipe or tubing, angles, miters, bevels, spiral slots, cams, serrations, and many different shapes and profiles can be made with the Woerner Tubular Profile Cutter just by following a template which can be developed and cut out in less than an hour...and changed in less than a minute. And the Woerner is accurate...to within .015 of an inch which gives proper fit-ups with no waste, and eliminates costly marking, hand-cutting, and grinding to fit. The low initial cost plus extreme efficiency of the Woerner give you high dollar savings.

WRITE US TODAY FOR FURTHER INFORMATION

UNIVERSAL PULLEYS COMPANY

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Alloy Rods Builds West Coast Plant

E. J. BRADY, president of Alloy Rods Co., York, Pa., says the company's new plant at El Segundo, Calif., will be in full operation by Oct. 1. Now building, the new structure is situated near the Los Angeles International Airport in an industrial area being developed by the Santa Fe Railroad. To be known as the Pacific Coast Division of Alloy Rods, it will produce the complete line of alloy electrodes. In charge will be George M. Hohmann, now production manager of the York plant.

Alloy Rods was established in York 14 years ago and is said to now produce about one-third of all stainless electrodes consumed in this country.

* * *

$13,500 in Prizes Offered to Service Industry Weldors

THE James F. Lincoln Arc Welding Foundation, Cleveland, has announced a $13,500 award program for selected business and service establishments. Men or women engaged in any of the named businesses may be able to earn an extra $1,000 this year by describing the use or possible use of arc welding in the maintenance, operation or services performed by the business. Awards will be made to individuals in non-industrial businesses and service establishments such as bakeries, dairies, hospitals, hotels, food manufacturers, buildings, municipalities, cemeteries, printing plants and newspapers. Awards range upward from $25 to the top of $1,000. A total of 191 awards will be given. None of the selected businesses or establishments is in a metal fabrication field where welding is generally used. An illustrated booklet of rules for the award program is available from the Foundation at Cleveland 17, O.

* * *

Research Reports Available

WELDING research carried on by Army Ordnance and the Navy Bureau of ships has been very beneficial to industry. Many of the reports carried on through National Research council can be secured through the Published Documents Division of the Department of Commerce, Washington 25, D.C.

Royal Welcome

For America's most honored *Guests*

At no other place and at no other time in 1953 will the power and vitality and productive genius of the vast and basic metals industries of America be so forcefully and so clearly demonstrated as in Cleveland's Public Hall this October.

Here . . . in bold, animated, live-action display will be the newest . . . the finest . . . the most wanted developments . . . and here, too, will be the alert, the wise, the idea-seeking men who make the metals industries go forward.

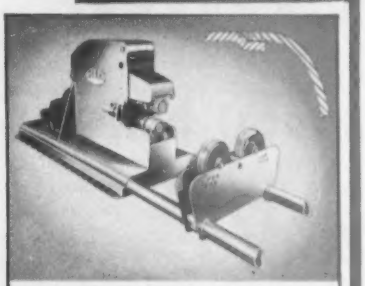
NATIONAL METALS EXPOSITION AND CONGRESS

Cleveland, Ohio, October 19-23

REED
ENGINEERING CO.

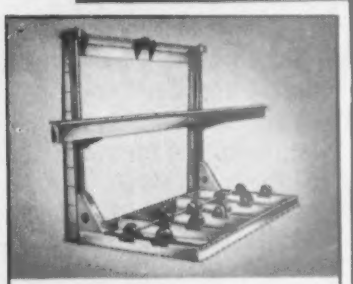
Modern
Metalworking
Equipment

- BENDING ROLLS
- TURNING ROLLS
- AUTOMATIC WELDING FIXTURES



REED OFFSET FORMING MACHINE

- ★ Improves automatic welding production by eliminating chill-rings and backing bars
- ★ Forms offset weld-backing joggle from tank shell
- ★ Loosens rust and mill scale
- ★ Improves shell roundness
- ★ Two models: M-2—1/16 to 3/16" plate
  M-4—3/16 to 7/16" plate



UNIT TYPE AUTOMATIC WELDING TURNING ROLLS

- ★ Combines adjustable track support and turning rolls into one fixture
- ★ In 5 standard models
- ★ Capacities up to 9 tons, 12 ft. diameters
- ★ Vertical and horizontal powered track adjustment on larger models

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to write us for specifications, prices, list of REED users near you. No obligation. Just write on your letterhead.

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Soviet Metallurgical Men Called on Carpet

PRODUCTION difficulties in the Soviet metals industry were recently aired by the Moscow radio, quoting editorials in *Pravda*. Plants and managers drawing fire included those in the Krivoi Rog ore basin, Dnepropetrovsk and in the Goro-Blagodatskoye region of the Urals. Executives in these plants were blamed by Pravda for "complacent and benevolent" attitudes that fostered lagging production.

Passing the buck, the executives complained that coal deliveries to their plants were far behind schedule. Mines in the major Kusbas and Donbas coal fileds had fallen behind in coal delivery contracts.

Another factor hindering expansion of Soviet metals production, said the managers, is the failure of the Ministry for the Construction of Heavy Industrial Enterprises (abolished since Stalin's death) to keep to its building schedules for new plants. The Ministry was said to be taking far too long to repair and rebuild existing plants and workshops.

—*McGraw-Hill World News*

* * *

Hungarians in Hot Water From Production Losses

FAILURE to meet iron and steel production schedules in Hungary last year may be duplicated in 1953 by the hapless leaders of that country. According to the Budapest radio, things are getting worse, too, because plant managers are neglecting maintenance in frantic attempts to make up production. Chief reason for the difficulties is said to be faulty and irregular supplies of raw materials but failure to apply shock-worker methods on the Soviet pattern is also blamed.

* * *

Membership Grows in Canadian Welding Society

EXECUTIVE secretary W. T. Cherry of the Canadian Welding Society recently gave a membership report to the society's national council showing that 541 individual members and 188 sustaining members were enrolled. The largest membership was in Toronto chapter with 138 individual and 45 sustaining members, followed by Montreal with 105 individual and 33 sustaining members. There are eight chapters altogether, including besides the two mentioned, Vancouver, Niagara, Hamilton, London, Winnipeg and Kitchener-Waterloo. New chapters are being contemplated at Kingston, Ottawa and Orillia.

Spokane Contract Shop Makes Big Strides

ONE of the outstanding metal fabricators in Washington's "Inland Empire" is Welk Brothers Metal Products, Spokane. The company's new 11,000 sq ft shop is arc welded throughout and the corrugated steel sidings and roof are stud welded in place. The shop has radiant floor heating, tinted plastic skylights and a 440-volt bus electrical feeder system throughout. Company designers made the welded craneway that handles such big projects as the 65-ft long jet fuel storage tanks shown in the picture above. These 13-ft diameter tanks are being fabricated by submerged-arc welding for the Fairchild Air Force Base near Spokane.

The shells of the tanks are automatically welded and the ends joined with a semi-automatic process. Shells are $\frac{5}{8}$-in. thick steel plate.

Welk Brothers started in business in 1946 with one arc welder and a cutting torch in a 30 by 50 ft garage. In 1948 they began production of small oil storage tanks for local consumption and in 1950 did subcontracting work on precision rolling and fabricating. First big job of the company was a contract for charge cans for a Spokane magnesium plant. They now have a standard line of oil storage tanks ranging in size from 5 to 50,000 gallons. They also make ornamental iron railings used in a patented product, "Welk Precast Concrete Steps."

* * *

Drawalloy Commences Spooled Wire Output

THE Drawalloy Corp., York, Pa., has started production of spooled wire for automatic inert-arc welding, according to E. J. Brady, president. The wire comes in 0.035 to 3/32 in. diameters in all stainless grades required by the welding industry. About 25 lb of stainless wire are contained on an expendable spool, which is made of extra-heavy plywood. Spools come packed in a sturdy carton of Drawalloy's own design.

A 3/32-in. deposit of HASTELLOY alloy C on the cutting edge of this shear blade has increased its life by four times. The edge can be rebuilt again and again, when it finally does wear.

HOT SHEAR BLADES STAY SHARP...when Hard-Faced with HASTELLOY Alloy C

TRADE-MARK

This shear blade is used in a plant producing tough non-ferrous alloys. Before hard-facing was adopted, the blades would chip, lose their edge, and have to be scrapped after shearing only about 50 tons of metal. They now can handle roughly four times that amount of metal because they are protected with HASTELLOY alloy C. They can be machined and hard-faced again when they finally do wear. One set of hard-faced blades has been in use in the plant for more than three years with periodic maintenance.

In steel mills, too, HASTELLOY alloy C has increased the life of blooming mill shears by as much as 10 times. Hard-faced blades have lasted 110 turns without maintenance.

HASTELLOY alloy C rod has also been applied to many other hot-working parts with outstanding success. The metal flows well by metallic arc welding or HELIARC welding without preheating. No peening is necessary. Deposits of HASTELLOY C work-harden in service. They can be machined by conventional methods.

For information on how to apply HASTELLOY alloy C to hot-working parts, write for a copy of "HAYNES Hard-Facing Manual." For on-the-job help in applying the rod, get in touch with the nearest District office.

HAYNES TRADE-MARK *alloys*

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
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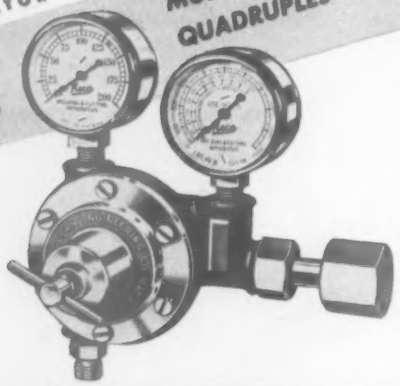
Meco SAF-T-CHEK REGULATOR

LASTS . . . 4 Times longer

MULTI-SEAT QUADRUPLES LIFE



Four times the life of ordinary regulators is guaranteed by exclusive four-seat construction. Each seat may be used successively – adjusted simply. No special tools or mechanical skill is required to maintain *any* part of the MECO regulator.

SAF-T-CHEK VALVES

This exclusive MECO construction provides insurance against seat or diaphragm failure. Built-in, self-actuating SAF-T-CHEK valves prevent damage to equipment from careless handling.

BOLTED DIAPHRAGM NEVER PUCKERS

Absolutely uniform pressure and flexibility is secured by *bolting* special alloy diaphragm – instead of conventional screw fastening which puckers diaphragm fibres. Diaphragm should last the life of the regulator.

Close yoke between diaphragm and multi-seat block insures transmission and correction of tiniest pressure variations providing constant and uniform pressure.

Meco

ASK YOUR MECO DEALER FOR FURTHER INFORMATION

Modern Engineering CO., Inc.

3411 PINE BLVD. ST. LOUIS 3, MO.

Faster . . . Safer Snagging starts here

Faster because Atlantic Speed-Tested Grinding Wheels feature a smooth, floating action that requires less pressure, reduces fatigue and speeds up snagging from start to finish.

Safer because every Atlantic Wheel made – from the 2 inch size on up – is test run at a 50% higher speed than that required for normal snagging conditions . . . safer because every wheel features a special Resinoid Bond for extra strength and long life under high operating speeds.

Lower cost, too. Atlantic Grinding Wheels seldom have to be dressed . . . reduce downtime . . . help keep replacement costs at a minimum. Try them and see. Specify Atlantic Wheels next time you order.

Send for the complete, fact-packed Atlantic Grinding Wheel Catalog now. Atlantic Abrasive Corp., 545 Pearl St., South Braintree 85, Mass.

ATLANTIC ABRASIVE CORP.

South Braintree 85, Massachusetts

NWSA Golf Outing Held by Philly Area Members

THE annual spring golf outing and dinner of the National Welding Supply Association members in Philadelphia and vicinity was held at the Reading Country Club, Reading, Pa., on June 11. Host was Thomas G. Butler, president, Butler Cylinder Gas Co., Reading.

The following companies had representatives at the outing which was the best attended yet: Butler Cylinder Gas Co., Reading; Gas Arc Supply, Philadelphia; Herr Welding Supply, Harrisburg, Pa.; E. R. Joseph, Norristown, Pa.; R. S. McCracken & Sons, Inc., Philadelphia; The Pennsylvania Welding Supply Co., Philadelphia; Blue Valley Welding Supply, Allentown, Pa.; Burdett Oxygen Co., Norristown, Pa.; Morey Flux & Chemical Co., Wilmington, Dela.; Atlantic Acetylene Co.; Aldan Oxygen Mfg. Co., Collingdale, Pa.; Welding Service Co., Philadelphia, and Virginia Welding Supply Co., Charleston, W. Va. National president William A. Rice, of the latter welding firm, made the trip to Reading particularly to attend the outing.

* * *

Solar Rollwelder Does Six Men's Job

A SPECIALLY-designed seam welder at Solar Aircraft Co., San Diego, Calif., replaces seven spot welders formerly required to do the same work. Cycle time for the welding operation (on jet afterburner fuel manifolds) has been cut from 4 hours to 45 minutes.

In operation the rollwelder makes a 3-in. diameter seam weld around the support bosses of the fuel manifold joining it to the engine exhaust cone. As a unique feature, the seam welding head moves in a circular path while the work remains stationary. The moving upper electrode carries about 14,000 amp through a 1½-in. diameter shaft and a floating joint. The lower electrode is essentially an air-operated clamping fixture. After positioning the work and closing the lower electrode, the welding operation is completely automatic. Although the machine is highly specialized for this job, it can be converted in 30 minutes to more conventional duties as a circumferential or longitudinal seam welder.

Designed by Solar, the machine was built by the Taylor-Winfield Corp. The basic machine was a medium series, 36-in. throat, 150-kva, low-inertia-head seam welder.

TO MOST *people nothing is more troublesome than the effort of thinking.*

—James Bryce

NWSA Members Hold Toronto Luncheon

THE first of a series of informal luncheon meetings planned for the eastern zone of the National Welding Supply Association was held June 5 in Toronto, Canada. Presiding was Robert G. Jackson, president, Jackson Welding Supply Co., Rochester, N. Y., and also eastern zone vice-president. Assisting Mr. Jackson in completing arrangements for the meeting were Ogden C. Mills, president, Mills Welding Supply, Inc., Buffalo, N.Y. and Charles H. W. Cane, Welders Supply Co., Toronto.

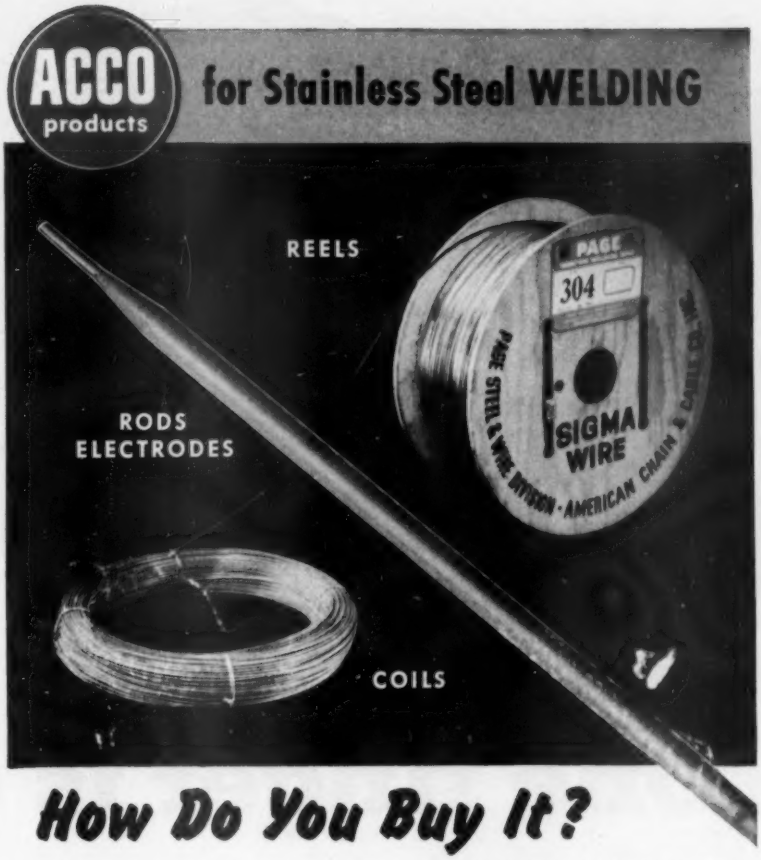
Mr. Jackson and Mr. Mills spoke informally on the various activities and services currently being undertaken by NWSA. Particular attention was given to the two reports on types of insurance carried by distributors and compensation of distributor salesmen. Those attending the luncheon were also interested in the annual overhead expense report which contains detailed operating figures of 85 distributors of welding supplies and equipment.

The following prospective members from Toronto and vicinity were present: Rog Margesson, Niagara Welders Supply Co., St. Catharines, Ont.; C. M. Wells, Curtis Wells, Toronto; W. R. Carter, Carter Welding Supplies Ltd., Hamilton, Ont.; S. D. Harris, Northern Welding Supplies Ltd., North Bay, Ont.; A. Bangay, Gas-Arc Welding Supplies Ltd., Toronto, Charles Noakes Equipment Sales, Toronto and K. J. Halladay, Toronto.

STEEL DATES—1893—*The first large nickel steel forging made in this country went into the axle of the first Ferris Wheel at the Chicago Exposition. Some nickel-iron alloys were prepared in America as early as 1853.*

"—SEE ANYTHING OF MY TEMPERATURE-MARKING STICKS?"

ACCO products for Stainless Steel WELDING



How Do You Buy It?

• No matter how you buy stainless steel welding wire—on reels, in coils, or packages of rods or electrodes—PAGE can supply you in a variety of analyses.

AC-DC Electrodes—Gas Welding Rods

Stable burning even at lower heats. Slag is clean and easily removed. Coating resists cracking right down to short stubs. Your choice from a complete line for every type of stainless welding.

for Inert Gas Welding

Six Page-Allegheny stainless grades in .035″, .045″, and .0625″ diameters. Precision thread-wound on 25-lb. non-returnable reels to fit popular arc welding machines.

for Submerged Arc Welding

PAGE stainless in wire diameters from 1/32″ to 5/16″, plain or copper coated. In layer-wound coils, 22″ or 24″ mill coils, or 200-lb. returnable steel reels.

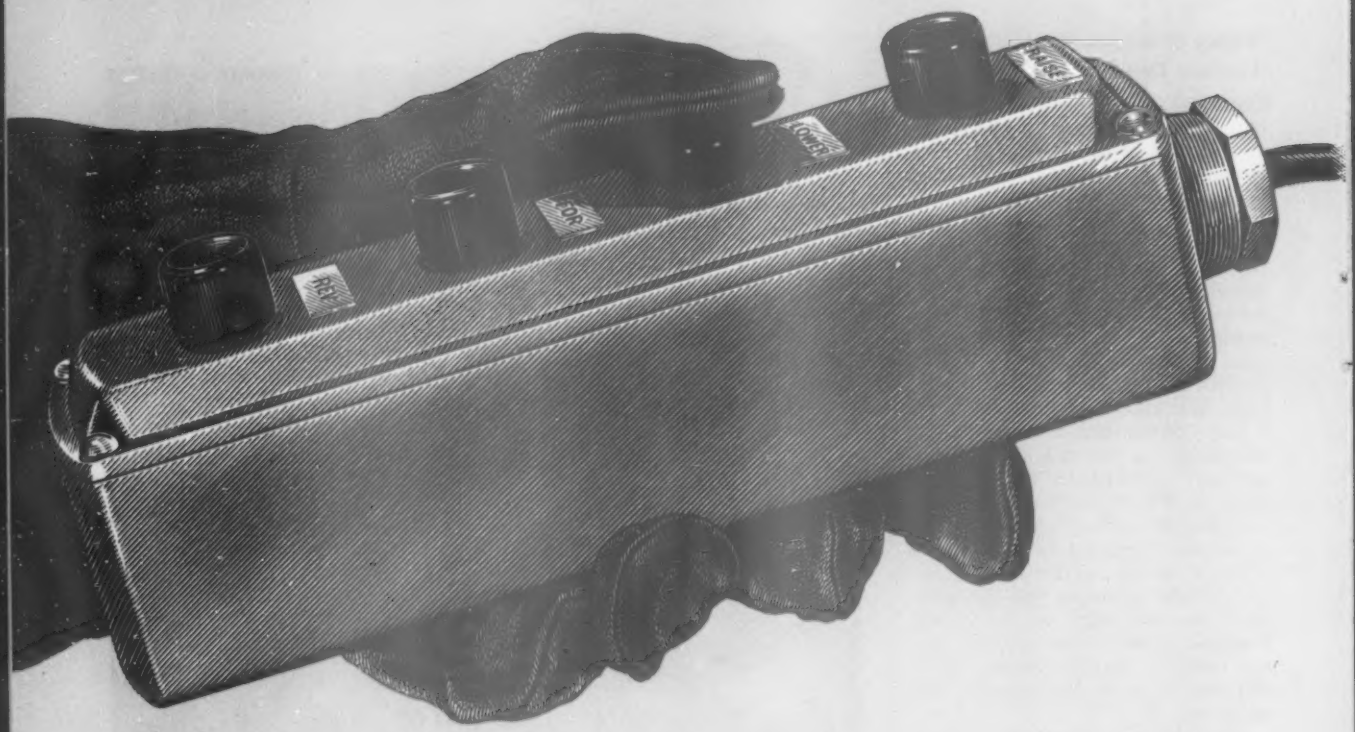
Write our Monessen, Pennsylvania office for literature and prices

ACCO

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.

PAGE Welding Electrodes Rods Wire

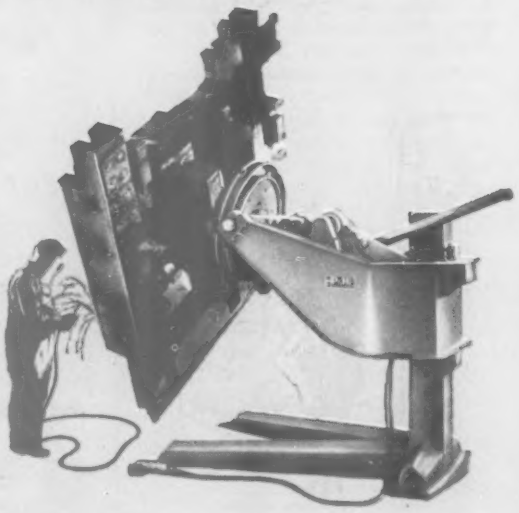


One finger is enough

to position heavy workpieces for fast, economical downhand welding

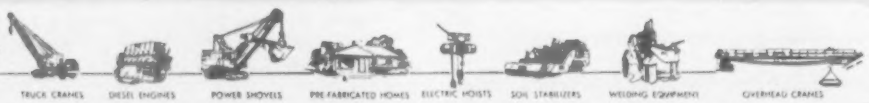
- with P&H positioners

Cut costs as much as 50% — position the weldment, not the operator! A touch of a control button does the work — saves handling time. Welding is downhand — permits using a larger rod for faster deposition. Welds are smooth, uniform. P&H Positioners are available in capacities from 2500 to 36,000 lbs. — remote-control and hand-operated models. Ask your P&H representative or distributor for further information — or write us.



P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4513 WEST NATIONAL AVENUE • MILWAUKEE 46, WISCONSIN

the P&H Line



Yoder Completes Mills for Non-Ferrous Tubes

THE first two tube mills for converting coiled non-ferrous strip at high speed into welded tubing have recently been completed by the Yoder Co. Mills built so far include one for the Bridgeport Brass Co., Bridgeport, Conn., that operates at speeds from 40 to 120 fpm. Its capacity ranges from ¾ in. to 4 in. tubing in gages from 0.025 up to 0.134 in. A similar mill was built for Kaiser Aluminum and Chemical Corp., Oakland, Calif.

An induction-welding process, the 40 to 120 fpm speed is from 10 to 30 times faster than practical by any method of non-ferrous strip welding heretofore known. The welding is done by high-frequency current introduced through a short inductor coil, through which the cold-formed tube passes without contact. The current travels around the surface of the tube in the region of the inductor. It then flows along the converging edges of the unwelded tube, to and from a nearby point of convergence. This is substantially beyond the field of induction and close to the center line of a set of rolls which press the seam edges together.

As the current approaches the point of convergence of the edges, it is confined to a very shallow layer on the surfaces of the two abutting edges.

Physical tests made on samples of type 304 stainless show that the tensile strength in the weld zone is about 15% higher than the parent metal. Welds in tubes made from different grades of aluminum, nickel and other metals, show uniformly narrow weld zones with a grain structure almost unaffected by the heat.

Operations so far have indicated that the mills will produce high quality tubing from almost all grades of aluminum that are available in coiled sheet form, certain magnesium alloys, a wide range of brasses and other copper alloys, nickel and nickel alloys, Monel, Inconel and austenitic and ferritic stainless steels.

It is said that the new process is well-adapted for making aluminum cable sheathing, a product rapidly being adopted for many types of telephone, power and bridge cable. The cable can be fed into the mill simultaneously with the strip so that the latter will be formed around it and welded without injury to any covering of paper or rubber.

Mills are now being built for the Aluminum Co. of America and the U. S. Navy in capacities of 8 in. and 5 in. diameters, respectively.

* * *

WHO *cannot give good counsel? 'Tis cheap, it costs them nothing.* —*Robert Burton*

New Trailer Side-Gate Lifts Six Gas Cylinders

ELEVATING side-gates, powered by compressed gas, that will lift up to 900 lb are featured on a new commercial truck-trailer developed by Trailmobile, Inc., Cincinnati. The trucks were designed to specifications for Air Reduction, Inc.

Each of the all-aluminum trailers is rated at 30,000 lb payload or about 200 steel cylinders of gas. To withstand the impact of the 150 lb cylinders, the trailer floor is made of heavy extruded aluminum. Spaced holes in the longitudinal body rails permit chains to be rigged for keeping a load of cylinders from shifting in transit.

As shown above, one side-gate on the curb side of the trailer lifts from ground level. Its compressed gas motive power comes from a cylinder in a compartment at the front end of the trailer. The lever for controlling the operation of the side-gate can be manipulated from the ground or from the inside of the trailer. On the dock side are conventional side-outlets for unloading cylinders at dock level.

* * *

Eutectic Builds Plant No. 3

A ground-breaking ceremony was held in June by Eutectic Welding Alloys Corp., Flushing, N. Y., for its new No. 3 plant to be built adjoining Plant No. 1. To be used for electrode production, the new building will house the most modern equipment for making them. A fully mechanized production line 273 ft long will be included.

* * *

Export Restrictions Lifted on Welding Electrodes

THE Welding Equipment Section of the former NPA has open-ended electrodes for export.

P&H

Arc Welders and Electrodes

put welding in your plant on a low-cost, high-production basis

P&H DC RECTIFIER WELDER

Has Dial-lectric Control for instantaneous heat selection at the work. Three sizes, 200, 300, and 500 amps., NEMA rated.

P&H WELDING TWINS

P&H AC WELDER

Has P&H Dial-lectric Instantaneous Remote Control. Sizes up to 625 amps., NEMA rated. Connectable to 220 and 440 volts.

P&H WN-301 Engine-Driven DC ARC WELDER

Portable. Equipped with Dial-lectric Control. Runs at only 1750 rpm. Welding service range, 60-375 amps., NEMA rated.

P&H LOW-HYDROGEN ELECTRODES

13 types that take the problem out of welding high-sulfur, free-machining, low-alloy, and high-strength steels; castings, etc.

Ask your P&H representative or distributor for complete information, or write for free bulletins.

P&H WELDING DIVISION

HARNISCHFEGER CORPORATION

4513 W. National Ave., Milwaukee 46, Wis.

CONTOUR CUTTING

Doesn't have to be a hair pulling proposition!

Yeh, Joe won the contract all right . . . the whole ding-blasted works . . . miles and miles of pipe fabrication and some of the darndest shapes to cut you ever saw! Joe lost money on that job. Oh sure, he made a profit, but he could have made more — lots more — with the H & M Shape-Cutter and Beveler. Joe didn't know it but the H & M could have saved **90% of his time** on those contour cutting problems. With the H & M Shape-Cutter all you do is attach the desired cutting pattern to the machine . . . slip the ma-

chine over the pipe and snap in place . . . light the torch . . . give the hand crank a few turns . . . and the job is done — the maximum SPEED WITH ACCURACY. Joe had a few choice words for those reject welds too . . . the H & M certainly could have saved him a lot of fuss and bother. If you're in the same fix as Joe get all the details . . .

WRITE FOR THE FREE FOLDER
"MORE PROFIT DOLLARS IN PIPE FABRICATION"

H&M PIPE BEVELING MACHINE CO.

Trade Mark Reg. U.S. Pat. Off.
311 E. 3rd. St. • Ph. 3-0241 • Tulsa, Ok.

One Week Welding School for Teachers, Aug. 24-28

A SPECIAL one-week welding course for farm and industrial arts shop teachers will be held Aug. 24 to 28 by The Lincoln Electric Co., at its Cleveland plant. Subjects to be touched on include arc welding, soldering, brazing and hardfacing. The most effective methods of teaching welding courses will also be demonstrated. Courses will be taught by Lincoln welding personnel, who over the years have graduated some 35,000 weldors. For more information write to The Lincoln Electric Co., Cleveland 17.

* * *

Organic Vs. Metallic Bonds to Be Talked in Fall

THE first comparison seminar ever held on organic and metallic bonding is scheduled for early Fall by the Eutectic Welding Alloys Corp., Flushing, N. Y. The 4-day sessions is open to everybody interested in the adhesive bonding of materials, says Renede D. Wasserman, Eutectic president. Outstanding speakers on welding, brazing, soldering and organic bonding agents will be engaged to speak to visitors, and wherever possible actual bonds will be made in demonstrations to prove discussion points. For further information, write Eutectic at 40-40 172nd St., Flushing, N. Y.

* * *

Inconel Dipping Trays Inert-Gas Welded

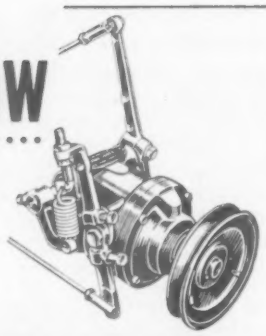
FOR bathing small parts in acid, a manufacturer recently ordered 2,000 dipping trays. The grille-bottomed trays weighed 63 lb. apiece and were made from corrosion-resistant Inconel.

A stainless steel fabricator, C. E. Howard Corp., South Gate, Calif., was chosen to weld up the trays by the tungsten-inert-gas process. Joints in the ⅛-in. thick and ½-in. round material had to be durable and as free from pits and corrugations as possible to eliminate trapping of acid. According to information from Linde Air Products Co., weldors at Howard used argon shielding gas, a 3/32-in. thoriated tungsten and Inconel rods to weld the joints at a speed of 15 to 18 ipm.

Correction

We mixed up some words on page 40 (middle column) of the July issue of THE WELDING ENGINEER. The last sentence of the top paragraph should read, "Unlike poles of magnets attract each other; like poles repel each other."

NOW



PIERCE
LONG RANGE
UNIVERSAL GOVERNOR

fits 9 out of 10 industrial gasoline engines . . . ideal for engine-driven welders.

gives accurate "variable speed" or "constant speed" engine control between 1200 and 2600 RPM.

See your welding supplies dealer or write to:

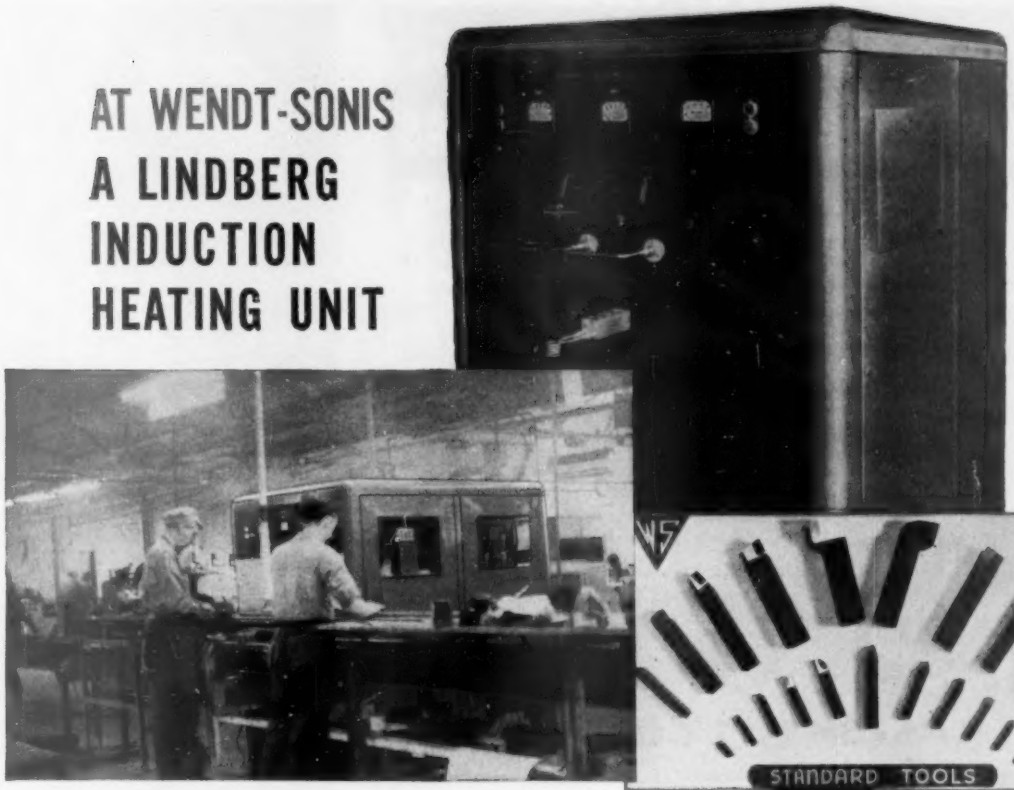
(DEALERSHIPS AVAILABLE)

THE PIERCE GOVERNOR CO., INC.
1618 Ohio Ave., Box 1000, Anderson, Indiana
World's Most Experienced Governor Manufacturer

BUY
SELL
USE
SHAWINIGAN CARBIDE

SHAWINIGAN PRODUCTS CORPORATION
EMPIRE STATE BUILDING
NEW YORK 1, N. Y.

AT WENDT-SONIS A LINDBERG INDUCTION HEATING UNIT



ups tool tip brazing 135% . . . replaces two units

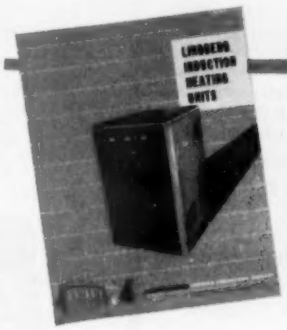
Production brazing of carbide tip tools has soared from 270 to more than 600 an hour since Wendt-Sonis, Hannibal, Mo., tool manufacturer, installed a Lindberg induction heating unit.

Two operators, fluxing parts and putting brazing metal and carbide tool tips in place, load the assemblies on a conveyor belt that passes a continuous stream of work through a specially designed, long hair-pin type heating coil.

Production is speeded because 14 tool assemblies . . . not just one . . . are in the heating field at any given time. The first tool on the conveyor passes *from* the heating area, leaving 13 others *still in* the field of heat, with tool number 15 *just entering* the coil area.

Production, formerly through two smaller units, totalled only 135 tools per hour, per unit, and required four operators. Thus the new equipment frees two operators for other important work.

If your requirements call for production brazing, soldering, hardening, annealing, stress relieving, hot forming, forging or shrink fitting, a Lindberg induction heating unit can better your production picture . . . minimize costs . . . increase profits.



Ask for a copy of Bulletin 1440. It pictures and describes standard models . . . illustrates 11 cost reducing features . . . lists applications . . . shows accessory equipment.

LINDBERG *HIGH FREQUENCY DIVISION*

Lindberg Engineering Company, 2477 West Hubbard Street, Chicago 12, Illinois

LET THE EXPERTS SOLVE YOUR
WORN EQUIPMENT PROBLEMS

Many owners of worn equipment have asked us to help solve their particular rebuilding and repairing problems. In many cases we have been successful in devising methods to put worn equipment (some already on the scrap pile) back to work quickly and economically with applications of . . .

MANGANAL

U.S. Patents 1,876,738—1,947,167—2,021,945
11%-13½% MANGANESE-NICKEL STEEL

These solutions were worked out by experts who have spent a good part of their lives determining the best methods of combating wear from impact and abrasion.

Check YOUR scrap pile or worn equipment and send your problems to us. You may save a lot of money and it won't cost you a cent for the answers. DO IT TODAY!

SEND FOR FREE MANGANAL WALL CHART

STULZ-SICKLES CO.
SOLE PRODUCERS 92 N. J. RAILROAD AVE. NEWARK, N. J.

NEAREST DISTRIBUTOR UPON REQUEST

USE
Silvaloy ALLOYS and FLUX
FOR SILVER BRAZING STAINLESS STEEL

Silvaloy 355 is a low temperature cadmium-free alloy especially adapted for brazing of food handling and dairy equipment, and where a close color match is desired.

Silvaloy 50 and 45 are extremely fluid. Free-flowing at temperatures of 1145° F. to 1295° F. Especially designed for production brazing on stainless steel.

GAS AND ARC WELDING ELECTRODES FOR THE WELDING OF STAINLESS STEEL

Coated rods in either A.C. or D.C. Titania coated or Lime D.C. coated.

USES

Use 1200 Flux for silver brazing Brass, Stainless Steel, Bronze, Nickel-Silver, Steel, Monel, Inconel, Nickel and Cast Iron. Furnished in ½ lb., 1 lb., 5 lb., and 30 lb. containers.

STEEL SALES
3348 S. PULASKI ROAD • CHICAGO 23, ILLINOIS
PLANTS: DETROIT, ST. LOUIS, MILWAUKEE, MINNEAPOLIS, INDIANAPOLIS
OFFICES: KANSAS CITY, GRAND RAPIDS

Nailable Floors Installed With Aid of Welding

SOME 200 gondola cars were recently fitted with nailable steel floors at the Chicago, Burlington and Quincy Railroad shops at Havelock, Nebr. This flooring is held down by a ⅜ by 1¼-in. bar running the length of the car. Using the submerged-arc process, the bars were fillet-welded to the toe of a side-sill angle running along the car on each side. The flooring was then welded to the other side of the bar by a second fillet weld as long as the first.

Each submerged-arc machine rode along the car floor on 10-ft long fabricated aluminum tracks, which were leap-frogged so that the weld seam was continuous. Welding speed for the ¼ in. fillet was 22 ipm at 400 amp, 26-28 volts. For the weld between the side sill and bar, welding speed was 32 ipm. D-c was used on both operations, according to word from the Oxweld Railroad Service Co.

* * *

Metal & Thermit Names Alaskan Distributor

AMONG nine new distributors recently announced by Metal and Thermit Corp., New York, is Alaska Welding Supplies, Inc., Anchorage, Alaska. The eight others are Auto Gas Light & Appliance Co., North Bergen, N. J.; Butler Gas Co., New Brighton, Pa.; Fidelity Sales, Newark, N. J.; Littrell Parts Co., Inc., Reading, Calif.; McKinney Welding Supply Co., New York City; Merritt-Holland Supply Co., Wilmington, N. C.; San Antonio Machine & Supply Co., San Antonio, Tex. and Lee T. Staton, Riverdale, N. J.

STEEL DATES—1907: *Commercial vanadium steel made in this country was used in the manufacture of automobile axles.*

WHY IT PAYS TO BUY STEEL FROM WAREHOUSE

You don't waste costly time rehandling steel stocks!

- LOWER INVENTORY COSTS
- LOWER SPACE COSTS
- LOWER TIME COSTS
- LOWER CAPITAL INVESTMENT
- FASTER PRODUCTION
- FEWER INVENTORY LOSSES

UNLOADING and distributing bulk shipments of steel to storage area and then to production and job sites demand added time, manpower and equipment. Eliminate these added costs by letting U. S. Steel Supply deliver your steel to the spot, in the condition and at the time you need it. Fifteen warehouses with the most modern steel handling and delivery equipment assure your complete satisfaction.

U. S. STEEL SUPPLY

DIVISION

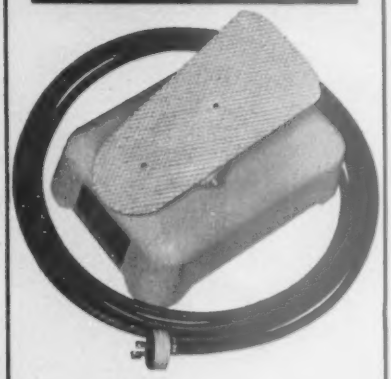
General Office
208 So. La Salle St., Chicago 4, Ill.

USS

Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

Vary the welding heat at the Work instead of the welder!



Mullenbach

ARCTROL

Provides *portable* voltage control at the work; selects the exact welding heat for every job *without walking back to the welder!* Retains full welder heat range; saves hours; makes better, more uniform welds. *Handiest aid any welder ever had*—for precision welding, for production jobs!

Available for most makes of D.C. arc welding machines. Write for descriptive ARCTROL circular, giving make and model number of your welder!

Mullenbach

Electrical Manufacturing Co.

2300 East 27th Street, Los Angeles 58, California

Pacific Division Set Up by Engelhard Industries

CHARLES W. Engelhard, president of Baker & Co., Inc., and of the other companies in the Engelhard Industries group, has announced the establishment of a Pacific division with headquarters in San Francisco and an office in Los Angeles. The purpose is to co-ordinate and expand the sales and service activities of seven companies of the group in the growing markets of the West Coast.

The seven organizations involved include Baker & Co., Hanovia Chemical & Mfg. Co., The American Platinum Works, Amersil Co., Charles Engelhard, Inc., Irvington Smelting & Refining Co. and the D. E. Makepeace Co. Division of Union Plate and Wire Co.

The American Platinum Works will continue to distribute its Silvaloy brazing products through Pacific Metals Co. Ltd., San Francisco, in the states of Arizona, California, Nevada, Utah and Hawaii and through the Eagle Metals Co. of Seattle in Idaho, Oregon, Washington and Alaska.

Thoms G. Ferruggia is general manager of the new division with offices at 760 Market St., San Francisco. William Schmidt, Jr., will be in charge of an office at 1111 Wilshire Blvd., Los Angeles.

* * *

Five New Distributors for Alloy Rods

CONTINUING the rapid expansion of its distributor organization, Alloy Rods Co., York, Pa., has added five new firms recently: Welders Supply Co., Erie, Pa.; Welders Supplies and Gases, Kalamazoo, Mich.; Beaver Welding Supply Co., Memphis, Tenn.; Price-Bass Co., Inc., Nashville, Tenn., and Paducah Iron Welders Supply Div., Paducah, Ky.

JOHNSON'S *NEW*

All-Purpose

BRAZING FLUX

JUST HAS SOMETHING NO OTHER FLUX HAS

YES experienced welders have found that this new all-purpose brazing flux really travels . . . really cleans metals . . . and DOESN'T BURN OUT!

TRY JOHNSON'S NEW FLUX on the toughest job in your shop . . . you'll be convinced that this flux beats any other flux you've ever used!!!

FREE SAMPLES
Sent upon Request

JOHNSON
MANUFACTURING CO., INC.
601 First Ave.
Mount Vernon, Iowa

WELDERS' CLAMPS

HARGRAVE
Tested Tools
THE CINCINNATI TOOL COMPANY

Each Tool Is Individually Power - Tested

Ask for CATALOG showing the most complete line of CLAMPS. Stock sizes from ¾" to 12' opening ½" to 16" deep.

THE CINCINNATI TOOL CO.
1944 Waverly Ave., Cincinnati 12, Ohio

THERE IS AN INDUSTRIAL DISTRIBUTOR STOCK NEAR YOU

FOR LOW HYDROGEN ELECTRODES

Weldrod coatings with TAM Ruflux T increase the speed with which a slag sets up while providing better slag control. Ruflux T is a compound containing approximately 91.5% ZrO and 5.4% SiO_2. Mesh size is approximately 0.1% on 325 mesh. Detailed information is easily obtained by writing our New York City Office.

*TAM and RUFLUX are registered trademarks.

TAM PRODUCTS
Registered U. S. Pat. Off.

TITANIUM ALLOY MFG. DIVISION
NATIONAL LEAD COMPANY

Executive and Sales Offices: 111 BROADWAY, NEW YORK CITY
General Offices, Works and Research Laboratories: NIAGARA FALLS, N. Y.

Look to TW for sound, reliable assistance in RESISTANCE WELDING

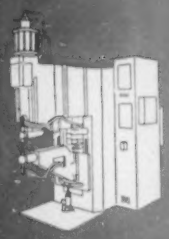
SPOT • PROJECTION
SEAM • FLASH-BUTT

WHEN designing new parts, resistance welding is the modern, economical production method. We can help you.

WHEN setting up a new production line, we can give you help with resistance welding's part in retooling.

WHEN resistance welding will improve your present setup — we have the answers.

WHEN you need practical help, we have application, design and field engineers available to give you facts, figures and the benefit of our 50 years of experience — 'phone or write your nearest district sales and service office.



Resistance Welders Since 1898

Sales and Service

CHARLOTTE · CHATTANOOGA
CHICAGO · CLEVELAND · DAYTON
DENVER · DETROIT · DALLAS
PHILADELPHIA · PORTLAND, OREGON
SEATTLE · S. PASADENA · ST. LOUIS
STAMFORD · WASHINGTON
DUNDAS, ONTARIO

TAYLOR-WINFIELD
RESISTANCE WELDERS

THE TAYLOR-WINFIELD CORPORATION • WARREN, OHIO

CANUTE R. OLSON has been appointed manager of the general sales staff of United States Steel Supply Div. of U. S. Steel Corp. He is a 1941 graduate of Illinois Institute of Technology with a B.S. degree in metallurgy. He has been acting general sales staff manager since May 1. He started with U. S. Steel as a clerk in 1936, and from 1940 to 1949 was a sales specialist in stainless and alloy steels.

* * *

A. G. BISSELL has been named engineering consultant to the Nelson Stud Welding Div. of Gregory Industries, Inc. He was civilian head of the welding, casting and forging branch of the Navy's Bureau of Ships prior to his retirement June 1. His home is in Seattle.

* * *

GEORGE E. GREGORY, president of Gregory Industries, Inc., has been elected a director of the Ohio Citizens Trust Co., Toledo, O.

* * *

DR. L. I. GILBERTSON has been appointed director of the Air Reduction Co.'s laboratories at Murray Hill, N. J. He was formerly administrative manager. DR. G. B. CARPENTER has been manager of the development staff with headquarters at New York. Both men will report to Dr. George V. Slottman, vice-president. DR. A. MULLER was appointed director of metallurgical research. DR. B. C. REDMON was named director of chemical research.

* * *

H. L. INGRAM, JR., has been appointed manager of the technical development department of the Air Reduction Sales Co., New York. He has been with Airco 18 years.

* * *

LOUIS H. NIEBLING has been made manager of the Midwest Piping Co.'s Chicago office. He has been with Midwest since 1928. WALTER JANESCH has been made assistant to Mr. Niebling in Chicago.

Low Temperature
EUTECTIC
WELDING ALLOYS

JB -
this will interest you!

NEW YORK

EUTECTIC TO HOLD FIRST COMPARISION SEMINAR ON ADHESIVES

Synthetic Resins VS. Brazing and Soldering

Flushing, N.Y.—The first comparison seminar ever held on organic bonding is scheduled for the early Fall by the Eutectic Welding Alloys Corporation at its training institute in Flushing. It will continue for four days; is open to all who wish to investigate the adhesive bonding of materials, and should prove invaluable to design engineers, production men, and all who have problems in bonding.

"Industry has long felt the need," stated Rene D. Wasserman, president of the corporation, "for some reliable data upon adhesives in which a comparison is made with conventional joining materials. Such information from a company manufacturing adhesives might be considered prejudiced in favor of its products and the same applies to a firm manufacturing welding materials.

"Eutectic's position as a pioneer in the research and manufacture of solders, brazing and welding alloys enables it to speak authoritatively on this subject. It can speak similarly upon adhesive bonding because of its ChemoTec Division which was organized to develop organic bonding agents. It is thus in the unique position of being able to tell the unbiased truth of the advantages and limitations of adhesives in general and the epoxy adhesives in particular."

Speakers of repute, all experts in their chosen fields, have been approached. All welcomed the idea as one which will do much to clarify a very obscure situation. A metallurgical engineer will explain what can be done with metals and, within the limits of present day knowledge, what cannot be done. A man who has grown up with the plastic industry will discuss synthetic resins. Well known design engineers will state their experiences, their successes and failures. They will explain how a simple change in design can increase productive capacity and take advantage of modern bonding materials. Production men will report upon curing cycles and how production schedules are improved or complicated. They will compare the high skill necessary to produce a satisfactory welded joint, with the small amount of skill required when adhesives are used.

All schools of thought will be represented and the theory expounded will be put to a practical test so that definite conclusions may be drawn.

Certain factors must be explained in detail and in relation to the metallurgical or organic nature of the bonding agent. The tensile strength of a specially formulated epoxy resin base adhesive, may be more than adequate for the joint involved. The peel strength, however, may be negligible. This weakness, common to many adhesives, can be counteracted by a change in design. This feature, the importance of design, will be stressed throughout the seminar. Butt joints are practical only if the filler has good adhesion and strength. A solder conceivably could have an adhesive strength at the interfaces of 50,000 psi. through alloying with the parent metal, but the strength of the joint would be that of the solder. Thus if the solder had a tensile strength of 6,000 psi. this would be the breaking point of the joint despite the high strength at the interfaces.

Soldered and brazed joints will be demonstrated, after which similar parts will be adhesively joined. Comparisons will be made, the advantages and disadvantages pointed out, and then demonstrations will be given to show how a simple change in joint design can give an adhesive joint the strength of a brazed one.

Synthetic adhesives have certain characteristics which make them ideal for certain operations. Their wettability is unique. They wet, not only all metals, but most non-metallic, non-porous, or porous surfaces. This will be shown in contrast to conventional soldering where elaborate treatment is necessary upon unprepared metal.

The advent of paste solder, which combines solder and flux in the form of a paste, has eliminated many of the disadvantages of conventional solder. A comparison test will be made with this material to show how its thin flowing, self fluxing action facilitates the bonding of long lap joints. The flowing qualities of adhesives will then be tested upon similar joints.

Case histories will be examined to show actual applications; their study will determine their efficiency compared to methods previously used. Joining emblems to semi precious stones was done originally by means of rivets. A change over to organic bonding reduced the number of operations from 12 to 6. The cost was reduced proportionately and rejects were practically eliminated.

Case histories such as this will be used to show how others have adapted the latest organic bonding techniques to reduce the number of operations and produce a more satisfactory product.

It is hoped this seminar will be a real contribution to industry and will make known the conditions under which an adhesive bond will be satisfactory—and when it will be unsatisfactory. The corporation feels it is in a unique position to demonstrate both bonding methods and to leave industry to select that most suitable for its requirements.

The seminar will be presented as a service to industry. There will be no charge, but those attending will be expected to pay their own transportation and accommodation charges. Requests for further information should be made to Eutectic Welding Alloy Corporation, 40-40 172ndStreet, Flushing, New York.

Cool Eutectic -
and get more
information -
H

NON-I

solves Alumi

An extremely
join aluminum
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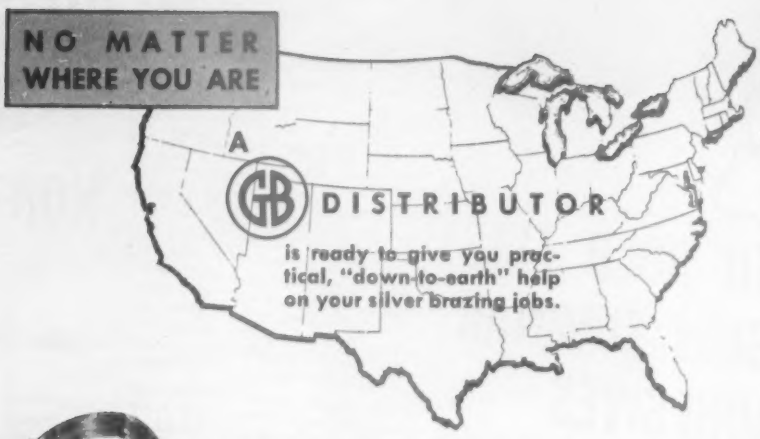
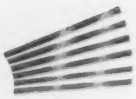
Walks Out | U. S. F

EUTECTIC WELDING ALLOYS CORPORATION • 172nd Street & Northern Blvd. • Flushing 53, N. Y., N. Y.



GB's Distributor Sales Organization is made up of experienced salesmen who have a broad background of practical operating experience, as well as technical training, in silver brazing applications. One of those men is in your area—and he wants to work with you to find how GB Silver Brazing Alloys and GB Fluxes will speed up your operations, give you maximum results and save you money.

Each GB standard Silver Brazing Alloy is developed for specific cost and production requirements. They are all available in these easy-to-use forms . . . wire in coils or straight lengths, strips, sheets, simple or intricate formed pieces.



Call in your GB distributor for all the facts about the GB line—he'll gladly supply you with working samples of GB alloys and fluxes, as well as give you helpful assistance on any brazing problems you may have. (If you don't know his location, simply write us and we'll send his address.)

GB FLUXES . . . available in three main types to cover the low temperature silver brazing range:
GB No. 99—working range up to 1350° F
GB No. 88—working range up to 1650° F
GB No. 27—working range up to 2000° F

GB FLUXES . . .
Dissolve metallic oxides readily
Provide uniform flow of silver brazing alloy
Insure high joint strength

GB FLUXES

The physical properties and appearance of a brazed joint are controlled to a large degree by the flux which is used. For this reason it will pay you to team-up GB Flux with GB Silver Solder—they were developed to produce maximum results when used together.

GOLDSMITH BROS.
SMELTING & REFINING CO.
1300 W. 59th, CHICAGO, ILL.
Suppliers of Precious Metals to Industry Since 1867

Blackford

Tingler

LESTER J. BLACKFORD has been appointed sales manager of the Viking Division of Progressive Welder Sales Co., Detroit. EARL A. GOYEAU has been named assistant sales manager. WILLIAM F. TINGLER has been named as director of advertising and sales promotion for Progressive. Mr. Blackford assumes his new post after three years as district sales manager of Welding Equipment and Supply Co., Detroit. Mr. Goyeau was also with Blackford at Welding Equipment and Supply. Twelve years of practical welding and advertising experience recommend Mr. Tingler to his new post. He will handle all promotion activities on the wide range of products manufactured and marketed by Progressive and its affiliated companies, including resistance and arc welding machines, fixtures and plastic tooling.

* * *

CHARLES L. HELMS has been made manager of marketing administrative practices in the welding department of General Electric Co., Fitchburg, Mass. AUSTIN HILLER is now manager of marketing analysis and planning research and AUSTIN LEACH, manager of renewal parts. Mr. Helms has been manager of sales services for the department. He joined the company in 1928. Mr. Hiller joined G-E X-Ray at Milwaukee in 1946, transferred to the welding department in 1950 as a sales engineer. Mr. Leach joined G-E in 1949 as a test engineer at Schenectady.

* * *

DR. JOHN M. PARKS has joined the staff of the research laboratories of Air Reduction Co., Inc., at Murray Hill, N. J., as manager of the metallurgical process division. He was with Armour Research Foundation at Chicago, where he engaged in numerous research projects in the physical and mechanical properties of metals. A graduate of Purdue, he received his PhD from Rensselaer Polytechnic Institute.

* * *

SIDNEY SCHWARTZ has been appointed general manager of sales and manufacturing for Acme Spot Welding, Inc., Brooklyn, N. Y.

FRANK GRAMM has been appointed eastern regional sales manager of the Welding Products Division of A. O. Smith Corp. His headquarters will be in the new Lancaster, Pa., electrode manufacturing plant to be completed this summer. He was formerly with Lincoln Electric Co. before joining A. O. Smith in August, 1952.

* * *

The following changes and appointments have been recently made by American Wheelabrator & Equipment Corp., Mishawaka, Ind. ROBERT L. ORTH was appointed field sales manager after 14 years service as district manager in the Detroit sales office. JULIUS E. SKENE was advanced to manager of customer service and PHILIP R. JORDAN was promoted to chief sales engineer. GORDON R. BRYANT was promoted to district manager of the Detroit office. JOHN W. SWANTZ joined the Detroit office as a district sales engineer. ERWIN C. SHEPHARD went to Detroit as a service engineer. F. H. TOMAS was appointed district sales engineer in Chicago. J. DOUGLAS LAMB was made district service engineer for the Toronto office. WILFRED G. CARRIE was made district manager at Seattle. GEORGE C. TOLTON was made district manager of the Greensboro, N. C., branch.

* * *

E. FINLEY CARTER was appointed vice-president and technical director of Sylvania Electric Products, Inc. HOWARD L. RICHARDSON was made vice-president in charge of engineering operations.

* * *

RAYMOND M. DENNIS, manager of fabrication at the By-Products Div. of Lukens Steel Co., retired June 30 after 28 years of service with the company. WILLIAM D. TAYLOR, formerly assistant manager of fabrication, took over from Mr. Dennis. R. RUSSELL FAYLES was assigned as staff assistant to Mr. Taylor. HARRY A. FOHL, manager, maintenance and construction division at Lukens Steel Co., has turned over active direction of the division to REUBEN G. UHLER. Mr. Fohl will serve as division adviser until he retires next year.

* * *

Died . . .

CHARLES SINCLAIR SMITH, 59, former western sales manager of Linde Air Products Co., died July 4 at Oakland, Calif. He joined Linde in 1915 as a salesman and subsequently became general sales manager for seven western states and northern California district sales manager. He was a past president of the San Francisco Sales Executives Association.

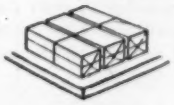
DryRod Electrode Oven

Speeds up welding
Saves rejects, scrap loss
Better welds at lowest cost

- Circular design — essential to uniform heat distribution
- Automatic temperature control, 175 to 550° F
- Protects 350 lbs. of 10" to 18" size rods
- Sturdy reinforced-welded sheet metal construction
- 840 watt heat unit, 110/220 or 220/440 volt AC

Unpackaged welding electrodes (low hydrogen, stainless steel types) pick up moisture fast. Within 2 hours, rods exceed U. S. Govt. limit of .2% . . . within 24 hours moisture absorption may exceed 5.2%! Moist electrodes are responsible for most welding headaches — rough welds, X-Ray porosity, under-bead cracking. Resulting reworking, rejects, rod scrap often cost you many dollars per day. Assure yourself better quality welds . . . for less than a dime per day operating cost. Protect electrodes with Dry-Rod, the *original* Electrode Oven. See your welding supply dealer or write direct for details.

4 Ways to cut costs and improve quality of your welds the easy DryRod way



1 Store sealed cartons in warm, dry place.

2 Place unpackaged electrodes in DryRod Oven and withdraw as needed.

3 Locate DryRod as close to welding operations as possible.

4 For flexible, large-volume storage, stack ovens with compact DryRod Stands.

Phoenix Products Co.
Milwaukee 16 Wisconsin

DryRod Electrode Oven

Ask to see *DryRod* at your welding supply dealer

WRITE FOR FULL INFORMATION

Phoenix Products Company
4715 N. 27th St., Milwaukee 16, Wis.

Clip coupon, attach to letterhead or mail direct for new bulletin DR-752.

Name.....
Firm.....
Address.....
City.....Zone..State.....
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Sellstrom
QUALITY
EYE AND FACE
Safeguards

125 Times More Service From New Plastic Welding Cover Plate

After several years of continuous testing under actual working conditions, we now announce our new "Long Life" clear plastic welding cover plates and lenses. We call them "1,000 Hour" welding cover plates and lenses but tests have proven that you can expect 1,500 hours of service. Consider these facts:

1. "Long Life" cover plates are made of a special clear plastic, 1/16" thick, assures rigid plate and practically eliminates a prism or double vision.
2. Not affected by acetone, benzine, gasoline, high octane fuels or high temperatures. Bending pressure does not cause crazing. Withstands pitting from welding arc. Scratch and spatter resistant.
3. Extremely light weight, optically smooth surface, as clear as high quality optical glass.
4. The welding cover plates are in individual envelopes, 24 to a box. Cover goggle lenses come one pair in an envelope, 24 pair in a box.

Catalog Number P K U—"Long Life" Clear Plastic Cover Plates, 2" x 4 5/16" standard size for arc welding helmet.

Catalog Number L K U—"Long Life" Clear Plastic Cover Lenses, 50 m/m.

These cover plates and lenses are so extraordinary, you will want to test them. Order from your dealer or write us direct for additional details.

sellstrom
MANUFACTURING COMPANY

More Than 300 Eye and Face Safeguards

626 North Aberdeen St., Chicago 22, Ill.

Welding Businesses

SUCCESS THROUGH WELDING. Published by The Lincoln Electric Co., Cleveland 17, Ohio, 1953. Paper, 8½ by 11 in., 50 pages. Price 50 cents.

This 50 page booklet of business success stories is dedicated to America's "small business man." The dedication acclaims the small business man as the modern American pioneer who has declared his independence and individualism by standing on his own ability and rising through his own energy.

It is estimated that the country has over 9 million small business concerns each employing fewer than 25 people. How 25 of these small businesses have succeeded is told in the booklet. These businesses all happen to have in common the fact that the arc welding process created the opportunity for the successful owners to realize their ambitions. However, the success retold here doesn't glorify an industrial process, but rather points out that today there still is opportunity in the American tradition of free enterprise. Success still comes through perseverance, ability, hard work and individual initiative in thought and action.

All the articles are reprinted from The Lincoln Electric Company's magazine for arc weldors, the *Stabilizer*, where they have appeared in editor A. F. Davis' Liberty Bell series. The series was so-named because individuals who have succeeded in their own businesses have really rung their own Liberty Bell, just as did the pioneers who founded our country.

* * *

Spot Welding Aluminum

RECOMMENDED PRACTICES FOR SPOT WELDING ALUMINUM AND ALUMINUM ALLOYS. Published by American Welding Society, New York 18, 1953. Paper, 6 by 9 in., 33 pages. Price $1.00.

This is a manual of practical design and manufacturing data. Because the welding of aluminum requires certain special considerations it was necessary to issue these recommended practices in a separate bulletin, rather than include them with the

THREE NEW GUIDES for METAL CUTTING

Now you can accurately, easily flame cut all kinds of shapes — circles, angles, bevels, straight lines. NEECO cutting guides convert ordinary hand torches into precision cutting instruments. Attached quickly — without tools. Neat, clean cuts need little or no grinding or machine finishing. Models to fit all torches, from 70° to 90° types. Cut circles from 1 to 66 inches diameter. Every shop should have these new guides — as basic, time saving tools or as standby equipment.

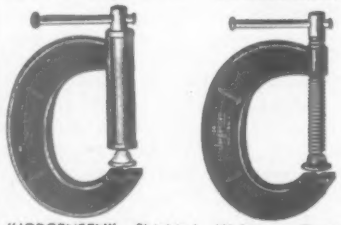
The new NEECO guides are of three types —for small circles (shown above), for large circles, and for straight lines.

Write for illustrated Bulletin 101 and model selection data.

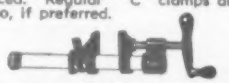
NEECO *Precision Flame Cutting —Fast and Exact!*

NEW ERA ENGINEERING COMPANY
458 West 29th St., Chicago 16, Illinois

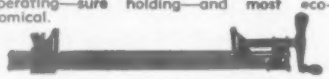
"Jorgensen" and "Pony" CLAMPS for WELDERS:



"JORGENSEN" Shielded Welders' Clamps eliminate damage from "spatter", and are low-priced. "Regular" "C" clamps are available too, if preferred.



"PONY" Clamp Fixtures make ideal bar clamps on any length of black pipe. Fast operating—sure holding—and most economical.



"JORGENSEN" Steel Bar Clamps are designed for the severe requirements of welding service; exclusive "multiple disc clutch" makes for instant adjustment—economy. The trade-mark "JORGENSEN" or "PONY" on your clamps is assurance of utmost satisfaction in service—specify and insist upon them from your supplier. FREE CATALOG ON REQUEST.

ADJUSTABLE CLAMP COMPANY
"The Clamp Folks"
426 N. Ashland Ave., Chicago 22, Ill.

recommended practices for steels and other metals issued in 1950. Included in this presentation is a table showing the combinations of aluminum alloys which can and cannot be spot welded. Mechanical and chemical cleaning methods are given for removal of surface oxide and foreign matter prior to welding.

Complete welding schedules are provided for welders of the given frequency converter, rectifier, electromagnetic and electrostatic stored-energy types, as well as standard a-c machines. The electrical and pressure characteristics of these machines are depicted on charts illustrated and suggestions are provided for altering welding schedules for specific applications.

A complete chapter on weld defects (illustrated by photographs) is presented and includes a discussion of the causes of different defects. The appendix contains a bibliography of 58 articles on aluminum spot welding for further information on almost any aspect of the subject.

Titanium Production Lag Discussed by NPA

PROBLEMS involved in speeding up deliveries of titanium products to military contractors were discussed at a recent meeting between an industry advisory committee and the NPA.

Government spokesmen told the committee that producers and fabricators of titanium will be asked to reschedule deliveries to military contractors. Such action is needed, they said, because of a lag that developed in production and delivery in May and June.

Members of the committee said the lag was due in part to a shortage of titanium sponge, the material from which sheet, bar, plate and other forms and shapes are produced. Government spokesmen said that expansion programs now in the works will increase production of the sponge. It is hoped the expected 1953 output (3,400 tons) may be quintupled by 1956 to an annual rate of 18,600 tons.

A task group representing titanium fabricators reported that melting capacity already substantially exceeds the ability of sponge producers to provide raw material. This group also reported it has made a study of facilities available to fabricate forms and shapes of titanium.

Generally, fabricators feel that melting and rolling capacity aren't as big a problem now as sponge production.

A second task group reported on the melting of titanium scrap.

Mid-States Simplified Welding

Cuts Production Costs!

- AUTOMATIC ARC STARTING
- INSTANT AMPERAGE CHANGES
- WELDS FERROUS AND NON-FERROUS METALS
- UNVARYING OUTPUT—NO "CREEPING"
- NO PRESSURE TO CAUSE PINHOLES
- NO MOVING PARTS TO WEAR OUT
- 100% PENETRATION—SMOOTH BEADS

You Can Do a Better, Faster, Easier Welding Job with these HEAVY DUTY Mid-States ARC WELDERS

Other Mid-States Arc Welding Equipment and Accessories

The "BULLDOG"

New Combination Arc Welder and Battery Charger — reconnectable for 110 or 220 volts. An all-around heavy duty portable welder.

For Automatic Arc Starting on All Welders

The "Missing Link" overcomes the necessity of "pecking" or "scratching" to start the arc, even with welders of low open circuit voltage. Any welding rod, A.C. or D.C. can be used.

No. 9000 ARC TORCH

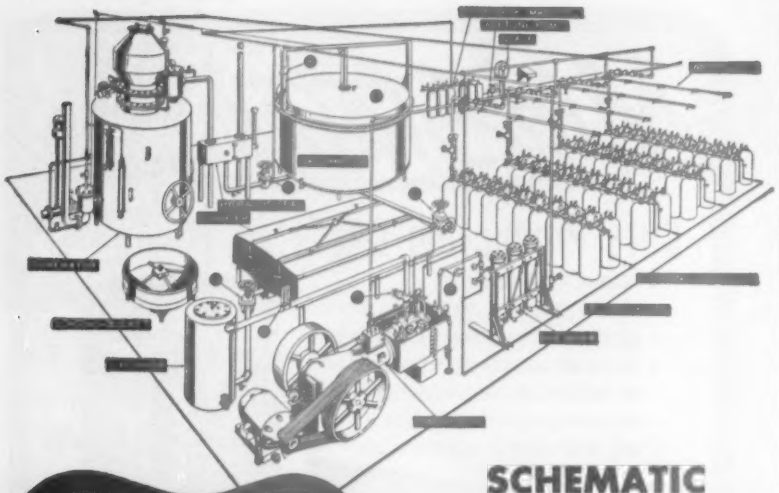
A versatile torch that assures sound welds on all metals—ferrous and non-ferrous. For A.C. or D.C. electric welders. Does brazing, soldering, hard-surfacing, heating, straightening and bending.

• Operators do not need special skill to do a perfect welding job with Mid-States Heavy Duty Welders. You can weld heavy and light gauges, even 22 gauge, without danger of burning through. In addition you can do brazing, soldering, hard-surfacing and heating.

Plug-in type welder transformers are wound throughout with double glass covered magnet wire and stacked with high grade electrical sheet. The Mid-States Heavy Duty Welder is a complete outfit for every welding need.

Write today for complete descriptive literature and the Simplified Welding handbook.

Mid-States WELDER MFG. CO.
6025 SOUTH ASHLAND AVENUE • CHICAGO 36, ILLINOIS



A *Low Pressure*
ACETYLENE
PRODUCING
PLANT
that Charges up to
160 CYLINDERS
at ONE TIME

SCHEMATIC PLANT ASSEMBLY

SHOWING LOCATION OF UNITS THAT MAKE UP THE PLANT

This plant layout provides simplest operation at low production costs. Compact design allows operator to watch all operations at all times.

LOW PRESSURE

GENERATOR

This 600-lb. acetylene generator fits into the above plant assembly. It stands out as one of the safest plants manufactured. Automatic controls minimize operating personnel. Rated capacity of the generator and plant assembly is 2700 cu. ft. per hour. The other units are designed for maximum production at minimum costs.

WE INVITE YOUR INQUIRIES

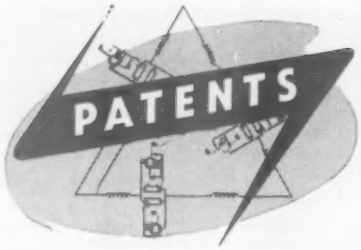
INDEPENDENT ENGINEERING COMPANY, Inc.

Manufacturers of

CONSULTING · RESEARCH · DESIGNING

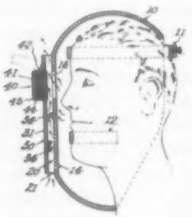
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN

O'FALLON 5, ILLINOIS



Ventilated Welding Helmet

2,638,592. CURTIS L. OLSON, Alexandria, Va. Filed May 24, 1951. Granted May 19, 1953.



This patent refers to a welding helmet having a face-covering portion with a sight opening in line of sight with the weldor's head. Plate means are mounted on the hood and define a chimney-acting air passage with the hood. The passage is vertical and has opposite open ends. The bottom open nd is an air inlet; the top an air outlet. A lens assembly is mounted in the plate means in line of sight of the weldor and in spaced relation to the sight opening. The sight opening provides an intake for warm air opening into the vertical chimney-acting air passage. Warm air enters the vertical air passage through the sight opening. It aspirates cold air from the surrounding atmosphere through the open bottom end of the vertical air passage. A mixture of relatively warm and cold air passes as a natural upward draft from the vertical air passage through the open top end. The resulting air draft through the vertical air passage prevents moisture from condensing on the lens assembly. Baffle plates in the air passage prevent entrance of arc flash in the sight opening.

* * *

Thoriated Tungsten

2,640,135. JAMES D. COBINE, Schenectady, N. Y. Assigned to General Electric Co. Filed March 30, 1950. Granted May 26, 1953.

This patent refers to a sintered non-consumable electrode which is capable of starting an arc instantly and maintaining a stable arc. It comprises 100 parts by weight of tungsten and 5 to 45 parts by weight of thoria.

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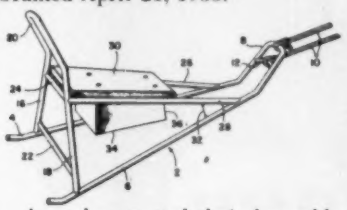
Weldor's Chair

2,635,926. WILLIAM MICHALOWSKI, Chicago. Assigned to United States Steel Corp. Filed Nov. 19, 1949. Granted April 21, 1953.



A newly patented chair for weldors comprises a pair of runners joined at their forward ends and diverging rearwardly. Legs are welded to and extend upwardly from the rear ends of each runner. The legs converge toward and are joined at their top ends to form the back of the chair. A cross member is welded to and extends between the legs at a point intermediate the height thereof. A self-supporting member is welded to and extends from each leg of the back part substantially at the height of the cross member to the adjacent runner and is welded to it next the forward end. A seat is fastened to the last-mentioned members. The seat extends from the back part to a point intermediate the length of the seat-supporting members.

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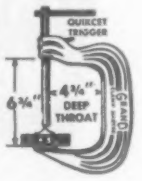

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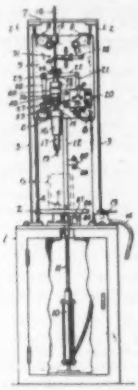
Carbon Arc Welding System

2,636,147. PERRY ANDERSON, Milwaukee, Wis. Assigned to A. O. Smith Corp., Milwaukee, Wis. Filed Jan. 7, 1950. Granted April 21, 1953.



A newly patented welding apparatus is adapted for use with a carbon electrode. It includes a support and means movably mounted on it to hold the carbon electrode. Means carried by the support effect movement of the holding means from an initial position until the electrode engages the article to be welded and to subsequently return the holding means to the initial position. Means are operably associated with the electrode to permit the electrode to move with the holding means until the electrode engages the article to be welded and to return with the holding means for a predetermined distance equal to the desired arc length. The electrode feeds with respect to the holding means when the distance moved by the holding means on the return movement is greater than the predetermined arc length but does not so feed when the distance moved by the holding means on the return movement is equal to the predetermined arc length.

* * *

Mild Steel Electrode

2,636,103. JOSE VAZQUEZ-ARIAS, Bogota, Colombia. Filed Dec. 17, 1951. Granted April 21, 1953.

A newly patented electrode comprises a low-carbon steel core having a copper plating on it. A flux coating encloses the core. The coating contains a binding agent, an alkali silicate, an alkali carbonate, cobalt oxide, calcium phosphate, manganese oxide, an alkali borate and a low-viscosity animal oil, which coating has been subjected to an atmosphere of gaseous carbon dioxide.

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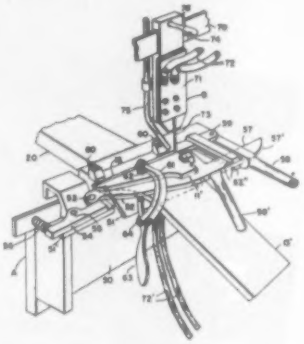
6714 Bryn Mawr Ave.

Welded Plowshares

2,636,105. ORWELL W. BROWN, Port Credit, Ontario, Canada. Assigned to Massey-Harris Co. Ltd., Toronto, Canada. Filed Jan. 14, 1950. Granted April 21, 1953.



This patent refers to an apparatus for welding plowshares which includes a base member, a main frame rotatably mounted on the base member and locking means for securing the main frame to the base member in either of at least two positions. A holding jig is secured to either end of the main frame and comprises a flat member for holding one of the pieces to be welded, a positioning member pivotably mounted at one end and adapted to be swung between operative and inoperative positions. Means are provided for securing the other end while in the operative position and clamping means to secure another piece to be welded to the positioning member.

* * *

Flame-Cutting Large Pipe

2,622,327. HARRY H. HALONEN, Milwaukee. Assigned to Nordberg Mfg. Co., Milwaukee. Filed July 5, 1947. Granted Dec. 23, 1952.

This patent refers to a pipe-cutting device having an elongated base that can be positioned within the pipe to be cut, generally along the axis of the pipe. It includes a number of sets of supports spaced along the base and adapted to extend between the latter and the inner surface of the pipe. A cutter assembly is rotatably mounted at one end of the base. It includes a cutter adjustable relative to the inner surface of the pipe. A control for the cutter assembly is located at the opposite end of the base at a point accessible to an operator outside of the pipe. A flexiblee, manually actuated control member for the cutter assembly extends from the control to the cutter. It is adapted, when actuated by the operator, to return the cutter to initial position after it has made a cutting revolution.

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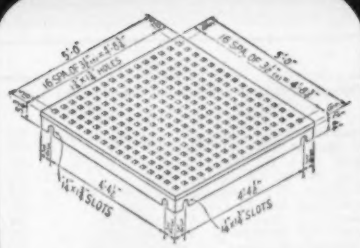

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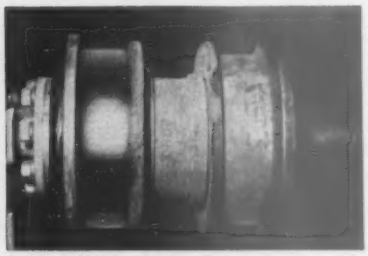

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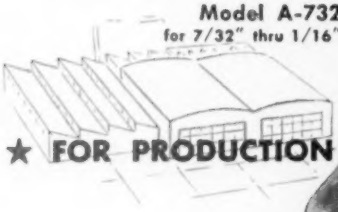
Model A-732
for 7/32" thru 1/16" rod



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"Super-Mel" is TWECO'S registered trademark name. It designates the only insulation that is internally keyed for strength and fit. "Super-Mel" tip insulators are precision molded with 30 or more layers of glass cloth impregnated with pure melamine resin binder. They withstand excessive heat without breakdown even under abnormal service conditions.

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WRITE FOR TWECOLOG #8 *Data and prices on the complete TWECO line of electrode holders, ground clamps and cable connections.*

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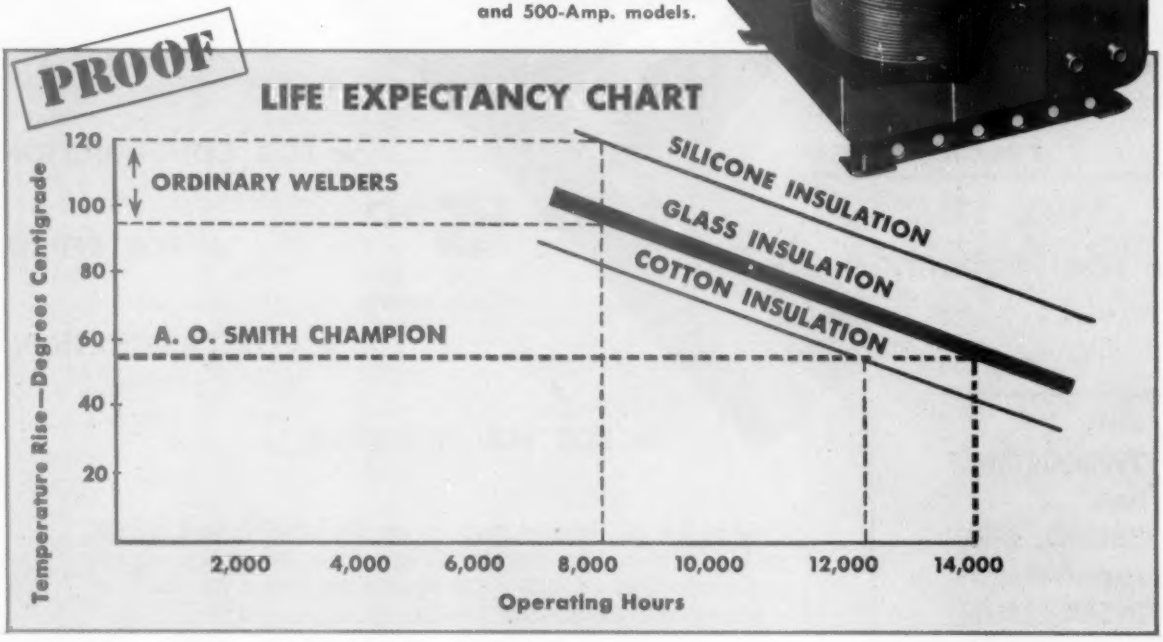

Temperature Rise Determines Machine Life

According to the Insulation and Aging versus Temperature Curves, as published by the A.I.E.E. . . . *the cooler a welding machine operates, the longer its production life.*

The A. O. Smith Champion is the *only* A. C. welder on the market with enough copper and cooling capacity to operate without exceeding a 55° C. temperature rise—as compared to the 90° C. rise allowed by N.E.M.A. for glass-insulated welders.

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Built for those who want the best in welding, the Champion has a full 75 open circuit volts, high-velocity down-draft ventilation, all-weather case, 12½ KVA power factor correction and stepless current control.

For additional information on welding machines, electrodes and accessories, see your local A. O. Smith distributor or write to A. O. Smith Corporation, Welding Products Division, Milwaukee 1, Wisconsin.

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